GAS

MARCH 1959

Plastics Pipe

Corrosion Prevention

A CHILTON PUBLICATION

THE NATION'S NATURAL GAS AUTHORITY

Rockwell Aluminum Meters

Rockwell Tin Meters

Tin or Aluminum?

Whatever you need

Whichever you prefer

Rockwell makes both tin meters and "hard case" aluminum meters in domestic sizes for every low pressure service. Both types are made to the highest quality standards. Both offer you a long life of accurate performance plus easy maintenance and low repair costs. Whatever your meter needs, whichever type meter you prefer, you can buy from Rockwell with confidence and the assurance of receiving the proven value of long established products. For bulletins write Rockwell Manufacturing Company, Pittsburgh 8, Pennsylvania.

GAS METERS

another fine product by

ROCKWELL

SAVE

SAFETY ACCURACY VALUE ECONOMY

CONTROL RELIABILITY
MEASUREMENT ACCURACY

RELIANCE Series 1400 Meter Bar Regulators and Type "B" Filters provide positive control with simple accessibility and easy interchangeability. Rugged construction and compact dimensions provide the ideal control package for the Gas Industry.

AMERICAN Welded Steelcase Meters provide a new concept in the economics of meter maintenance and retirement. Sustained accuracy is built into these meters with proven speed ratio and the many refinements developed by American in over 120 years of meter engineering.

The perfect combination for measurement and control . . . Regulators, Filters and Meters for every application in the Gas Industry—Commercial, Industrial and Domestic.

Write for bulletins containing complete specifications.

Specialists in Measurement and Control

AMERICAN® METER COMPANY
INCORPORATED (ESTABLISHED 1836)

AMERICAN METER CO MEASUREMENT ENGINEERS

RELIANCE REGULATOR DIVISION
ALHAMBRA, CALIFORNIA

CAP FORGED STEEL

INSULATING UNION

GREATER SAFETY • FEWER REPLACEMENTS

ENGINEERED—TESTED—PERFORMANCE-PROVED

for gas service

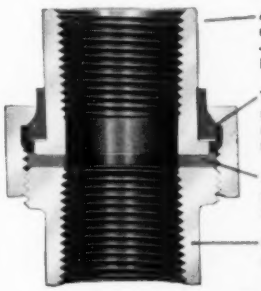
Each year, more corrosion engineers specify CAP Insulating Unions for their meter installations. These are necessary to assure maximum service from pipe and equipment. Insulating unions prevent corrosion caused by electrolysis.

Both the Capitol *Special* and *High Temperature* insulating unions are engineered specifically for gas service—performance-proved by years of service without a single failure—tested for assured quality control.

The *Special* insulating union is recommended for normal applications and will withstand up to 250° F (external heat). The *High Temperature* insulating union will withstand 450° F for one hour (the temperature at which solder in the meter will melt). The *High Temperature* union is designed for maximum protection against a gas leak in the event of a fire.

Only CAP gas service insulating unions have all of these features:

- Forged Steel construction—eliminates danger of sand holes or porosity.
- Exclusive Heavy Tapered Insulation—make connections 3-times stronger than light square type.
- Color Coded—for easy identification by service crews . . . orange for *Special* . . . yellow for *High Temperature*.
- Black oxide coated to prevent rusting.
- Two-thirds insulating unions, *Special* and *High Temperature* are available.


ALL FORGED STEEL for maximum tensile strength—no porosity—no sand holes.
TAPERED INSULATION assures 3-times stronger connections than light square type.
INSULATING is tested and proved effective, long-lasting.
NATIONAL PIPE TAPER for tighter joints.

Add to the life of your company's piping and meters by using CAP Insulating Unions on all installations.

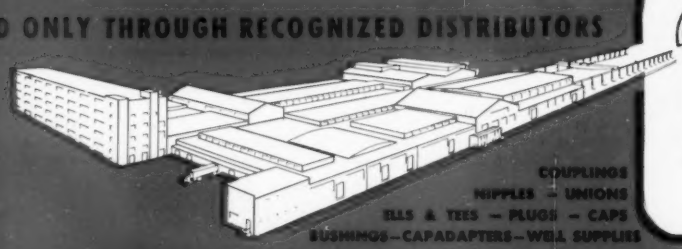
CAP *Special* and *High Temperature* Insulating Unions

Size	Overall Dimensions	Special Part No.	High Temp. Part No.	Quantity in Carton	Approx. wt. per 100
¾″	2.27″	GS-33	GHT-3	20	72#
1″	2.89″	GS-44	GHT-4	12	110#
1¼″	2.96″	GS-55	GHT-5	10	150#
1½″	3.07″	GS-66	GHT-6	5	220#
2″	3.48″	GS-77	GHT-7	5	340#

CARTONED:

Packaged in small cartons for easier handling, better protection, save time and reduce inventory losses.

SOLD ONLY THROUGH RECOGNIZED DISTRIBUTORS



CAP CAPITOL MANUFACTURING CO.
DIVISION OF HARSCO CORP.
COLUMBUS, OHIO

GAS

CONTENTS

March 1959

35TH YEAR OF PUBLICATION

VOLUME THIRTY-FIVE • NUMBER 3

FEATURES

Plastic Pipe and Corrosion Prevention Issue

Cooperation plus know-how equal successful corrosion mitigation 64
By David P. Price

Designing for minimum cathodic protection interference... 70
By C. A. Erickson

Reducing unaccounted-for gas by a leakage control and corrosion prevention program 72
By Truel E. Adams

Plastics pipe looks to biggest year 75
By Don Wright

Use of plastics pipe in a rural distribution system..... 78
By James V. King

Service renewal by plastics insertion 83
By James L. Higday

PIPELINE SECTION

How Westcoast prefilmed sour gas lines..... 125
By James Joseph

Coating steel pipe for gas service 129
By J. S Dorsey and C. E Lee

DEPARTMENTS

Editorial Comment—

Thermally Thinking, *by J. Fred Ebdon* 6
Highlights 8
Regulatory and Legislative Trends 11
Technical Trends, *by Guy Corfield* 27
Washington, *by Neil Regeimbal* ... 29
Corrosion Prevention, *by Marshall Parker* .. 31
Communications, *by Frank Chapman* ... 140

News Developments—

Gold Star ranges launched in Chicago 96
Public utility financing set new high in '58... 98
Michigan's new tariff plan suspended 142
Northern's major expansion outlined 144
PG&E asks California okay on line for Canadian gas 146

Departments—

Digest of New Products and Trade Literature. 87
People 105
Calendar 107
Associations 114
Pipeline People 152
Advertisers Index 158

BPA

GAS is published monthly. Copyright 1959 by Chilton Company, 56th and Chestnut Streets, Philadelphia 39, Pa. Subscription price: United States and possessions and Canada (in advance): one year, $2.00; two years, $3.00. Mexico, South and Central America, Caribbean Area: one year, $3.00; two years, $5.00. All other countries: $10 per year.
Accepted as controlled circulation publication at Philadelphia, Pa. Members: Business Publications Audit of Circulation, Inc., National Business Publications, Inc. Gas is indexed regularly by Engineering Index Inc. The name "GAS" is registered U. S. Patent Office.

NBP

you can depend on Lone Star API pipe

...quality controlled for long, trouble-free service

Crossing rivers, bending over steep hills and rugged terrain is routine for Lone Star electric weld line pipe. Joe Roughneck, heart of the oil and gas industry, knows he can depend on Lone Star API casing, tubing and line pipe . . from the oil country's own steel plant. Fully normalized, of course.

Neighbor, wherever you are, specify Lone Star and we both get a good deal.

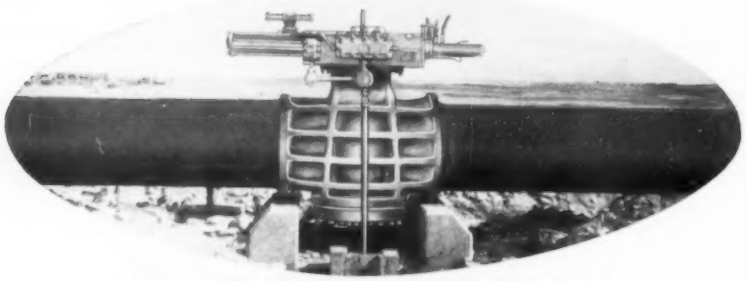
Lone Star STEEL COMPANY

EXECUTIVE—SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 12226 • Dallas, Texas
DISTRICT SALES OFFICES
912 Republic National Bank Building, Dallas, Texas
Houston, Texas | Midland, Texas | Tulsa, Oklahoma

Ledeen Gate Valve Operator with integral gas powered hydraulic oil system mounted on buried main line block valve.

Ledeen VALVE OPERATORS

FOR THE GAS INDUSTRY



Ledeen Quad Plug Valve Operator with auxiliary manual hydraulic control on compressor station block valve.

Whether you use gate or plug valves in your large gas lines, Ledeen has one of the most complete lines of operators and controls available for their automatic operation.

No matter what size valve is involved, write or call Ledeen for engineered recommendations.

Ledeen MFG. CO.

3334 No. Gilman Road
El Monte, California

CUmberland 3-3163

WRITE FOR BULLETIN 2030

GAS

A CHILTON PUBLICATION

198 S. Alvarado St., Los Angeles 57

Tel. DUnkirk 7-4337

Frank Chapman, Publisher

J. Fred Ebdon, Editor

Don Wright, Managing Editor
William T. Harper, Eastern Editor
Barbara Hall, Assistant Editor

Guy Corfield, Technical Editor
Neil Regeimbal, Washington Editor
Raymond A. Grote, Art Director
Gerald N. Smith, Research
Robert Gunning, Readability Consultant

Gilbert Bowman, Promotion Manager
Mary Lou Dorian, Production Manager
M. A. Kesterson, Circulation Manager

ADVERTISING OFFICES

New York (17)
Joseph R. Geryk
100 E. 42nd St.
OXford 7-3400

Cleveland (15)
Frank J. Enright
Richard Duffy
930 B. F. Keith Bldg.
1621 Euclid Ave.
SUperior 1-2860

Chicago (1)
Richard L. DeMuesy
360 N. Michigan Ave., Suite 418
RAndolph 6-2166

Dallas (6)
Harold E. Mott
189 Meadows Bldg.
EMerson 8-4751

San Francisco
Frank McKenzie
Merchandise Mart
1355 Market St.
UNderhill 1-9737

Los Angeles (57)
Jack Kay
198 S. Alvarado Street
DUnkirk 7-4337

JOS. C. HILDRETH, Board Chairman

G. C. BUZBY, President

Vice Presidents: P. M. Fahrendorf, Robert E. McKenna, Leonard V. Rowlands, George T. Hook. Treasurer, William H. Vallar; Secretary, John Blair Moffett. Directors: George T. Hook, Maurice E. Cox, Frank P. Tighe, Leonard V. Rowlands, Robert E. McKenna, Everit B. Terhune, Jr., Russell W. Case, Jr., John C. Hildreth, Jr.

Stanley Appleby, Comptroller

Gasoline, Diesel, or LP Gas—New Multi-Range 6-cylinder engines for the International 460 Utility—gasoline, Diesel, LP Gas—deliver 61 hp at the flywheel, 48 at the drawbar.

New International® 460 Utility tractor

...SMOOTH 6-CYLINDER POWER

with brawn to match!

Add new Multi-Range 6-cylinder power to International's traditional built-in brawn . . . you literally step into a *new world of utility tractor performance!*

Here's sensationally SMOOTH power, virtually vibration-free, to lessen operator fatigue and thus step up daily output. It's *economical* power, because new Multi-Range design delivers remarkable fuel economy at every load range. It's *flexible* power, with instant governor response to load demand at any engine speed from 900 to 1,800 rpm. And it's power, *balanced* with built-in brawn, that delivers over 48 drawbar horsepower for the widest range of heavy-duty utility tractor work.

Ask your IH dealer to demonstrate the new 460 Utility . . . or others in the complete International line, 12.8 to 72.5 bare engine hp. For free catalog, or name of your nearest IH dealer, write International Harvester Company, Dept. G-3, P. O. Box 7333, Chicago 80, Illinois.

See Your
INTERNATIONAL HARVESTER *Dealer*

International Harvester Company *products pay for themselves in use*—Farm Tractors and Equipment . . . Twine . . . Commercial Wheel Tractors . . . Motor Trucks . . . Construction Equipment—General Office, Chicago 1, Illinois

Built-in brawn means tractor strength and stamina to handle big buckets on heavy-duty International Pippin or International Wagner backhoes—sizes for trenching to grade 10, 12½, or 13¼ feet deep.

New Fast Reverser Unit speeds up shuttle-type operations. In each of five gears, the reverse speed is 22 *per cent faster* than the forward speed in that gear.

GAS

MARCH 1959

Thermally Thinking

THIS month some or all of the corrosion engineers and technicians in your company will be heading for Chicago. We wish the National Association of Corrosion Engineers every success.

I am afraid corrosion engineers in gas companies suffer some frustrations that infect many technical people in our industry. It is the product of what I call the "division manager is king" type of organizational set-up. This may be a little hard on division managers. Actually, what I have reference to is the man on the operational side of a gas distribution or pipeline company who is dedicated to resisting progress. He prefers to do things the way he has always done them in the past. His attitude quickly reveals that he considers corrosion engineers (and for that matter all engineers) or others proposing new and better ways are trying to increase costs within his area, division, district, or what have you.

This man has 20 to 40 years' experience in gas operations under his belt. In many cases he also has enough prestige or standing in his company to pretty well buck the corrosion engineers and even the chief engineer. Thus, he is able to change design and cut or pare where he sees fit.

Experience is a great teacher. But the school of experience is not the only source of good gas company management and operation. If we are going to rely on experience alone, we might as well forget the research laboratories, Cal Tech, MIT, Rice institute, the University of Texas, etc., etc. (If I have left out your little old school, please forgive me—space just doesn't permit.)

Now these corrosion engineers are as a group sharp cookies. That works against them from the start because they often find it hard to communicate on common grounds with some of the operating and construction chiefs. And in all truth, you will see a corrosion engineer get a little too scientific here and there.

However, on analysis it becomes obvious that the corrosion engineer and "division manager" are working at the same thing. Both are trying to save money.

The "division manager" (whom I have badly maligned for want of a better title to describe supervisors of construction and operations on the several levels) is sometimes inclined to put it in fast and loose, i.e., cheap. On matters of handling treated and wrapped pipe, proper installation of anodes and test leads, properly clearing foreign structures, and proper installation of insulation at specified points he is apt to have the attitude mentioned in Dave Price's article (p. 64) : "Let the corrosion engineer worry about it."

Borrowing again from Mr. Price, there isn't a major gas company around that can afford to staff enough corrosion engineers to supervise all phases of corrosion prevention and mitigation in distribution systems, pipelines, at compressor and other stations, and in the producing field.

Corrosion mitigation is everybody's business. All gas company personnel in construction and operating departments must study, preach and practice corrosion prevention in the field. The stakes in this corrosion prevention game are high enough to satisfy anyone if he just gets the over-all picture. If "division managers" (here we go again) will give the corrosion engineers their ear and some authority, the results will satisfy the leading operations-construction Midas in the business.

Similarly, corrosion engineers are cautioned against leaving just their south ends extending above the corrosion-prevention sand. They should know the other sides of the gas business from the Gold Star program, through gas-company cost consciousness, to the Federal Power Commission.

Effective corrosion prevention and mitigation is the product of cooperation. Cooperation among corrosion engineers and field forces is paying off in some gas companies. It can be made to do so for your company.

J. Fred Ebsan

EDITOR

Diaphragms to be used in regulators and controls are inspected to make sure they conform to exact gauge specified.

Absolutely accurate gauge or they don't pass!

One of Vulcan's 14 rigid quality control tests.

For over 25 years Vulcan diaphragms for regulators and controls have been the standard of quality and dependability for the industry. With good reason. Vulcan Diaphragms are quality-controlled from raw material to finished product. Whether it's low gauges for delicate applications, or heavy gauges for rugged service, Vulcan delivers the goods . . . **exactly as specified.**

Vulcan's quality control means you **always** get absolute accuracy, dependable performance and long life . . . and your maintenance costs are cut to a minimum.

That's why most of the leading manufacturers of meters, regulators and controls **always** specify Vulcan Synthetic Diaphragms. You can be sure too . . . by specifying **Reeves Vulcan Diaphragms.**

Another

REEVES

GEM

VULCAN

RUBBER PRODUCT

REEVES BROTHERS, INC.

1071 Avenue of the Americas • New York 18, N. Y.

GAS HIGHLIGHTS

Merger in Flatbush

Brooklyn's two gas distributors will consolidate. Brooklyn Union will take over Brooklyn Borough Gas Co. in a straight stock transfer, according to present plans. Arrangement now must be approved by stockholders of both companies, and New York PSC. This will be third company merged into Brooklyn Union in recent years. In 1956, it acquired New York & Richmond Gas Co. and Kings County Lighting Co.

Bigger, stronger pipe coming?

Gas industry may see line pipe with minimum yield strengths higher than Grades X56 or X60 and in outside diameters larger than 40 in., according to speakers at the recent Pipeline Contractors Association meeting in Bal Harbour, Fla. Also, non-destructive testing at mills and in the field is adding to pipe progress and will increase in importance. Good weldability and bendability with high-test, high-chemistry line pipe can be accomplished through additional training schools.

Incidentally, the Pipeline Contractors will hold their convention at Los Angeles' Ambassador hotel next January.

Another gas refrigerator debuts

Kirk Industries (South Norwalk, Conn.) has entered the gas refrigerator field. A 10.2-cu ft box is now on the market; company hopes to have smaller (5.5- to 7-cu ft) boxes ready soon. New refrigerator carries one-year warranty on entire unit, five years on absorption refrigeration unit. Kirk also makes kerosene refrigerators, mainly for export—is talking about a gas-fired deep-freeze.

Speed-up for Transwestern

FPC has moved starting date for hearings on Transwestern Pipeline's application up to March 10, month earlier than previously scheduled. Transwestern seeks okay to build line from west Texas to California border. Fight is expected on gas prices.

New "booster" for gas industry?

Rep. John D. Dingell (D.-Mich.) levelled a Congressional floor blast at what he calls "the greedy unconscionable gas and oil lobby." Occasion of his harangue—introduction of H.R. 366, the bill to free producers from Federal control. Rep. Dingell claims "the bill completely does away with all effective regulation of natural gas producers, and, if passed, will cost the consumers better than $1 billion which will be extorted from the American people and placed in the coffers of the unconscionable gas and oil lobby." Sounds like a campaign speech, doesn't it?

Parkway shoulder becomes right of way

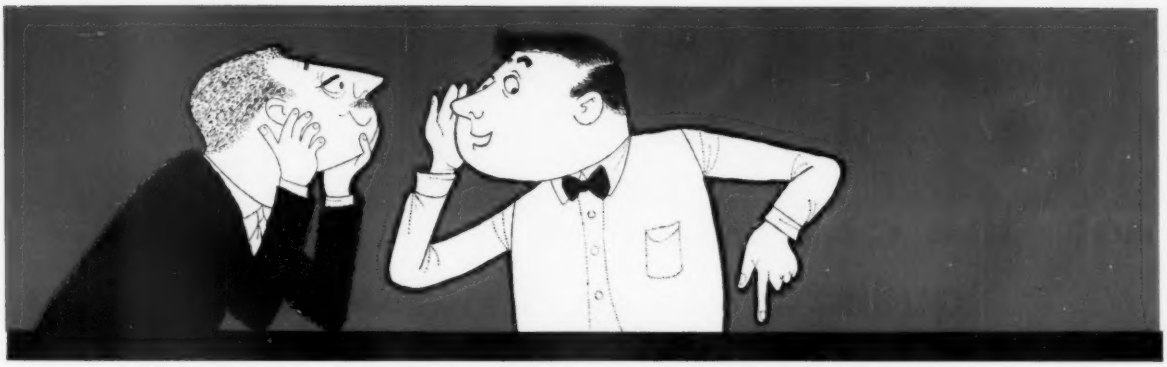
Visitors to Florida driving down the new Sunshine State Parkway between Ft. Pierce and Miami Beach are seeing a strange sight. The 24-in. Houston Texas Gas & Oil Corp. mainline is being laid in the Parkway ROW. It's visible where it jumps across numerous drainage ditches spaced at regular intervals along the parkway.

New gas legislation

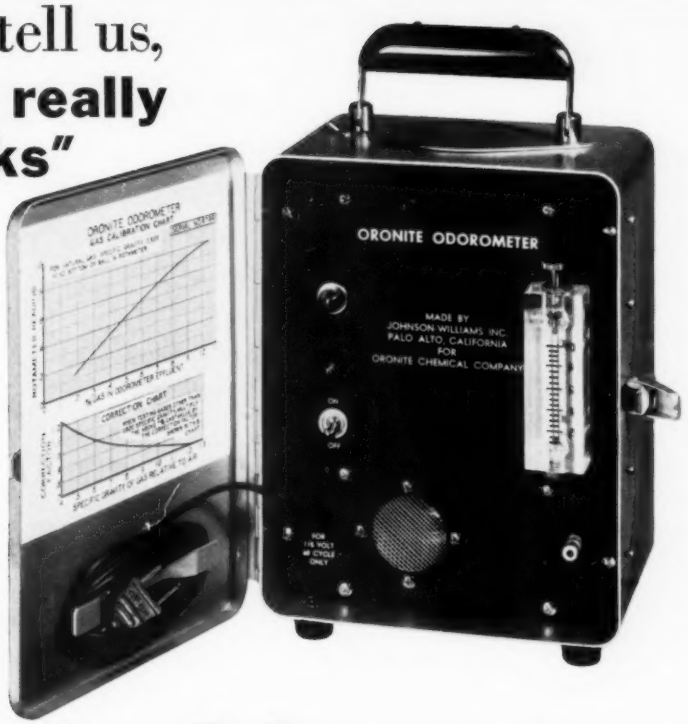
Rep. Emilio Q. Daddario (D.-Conn.) has introduced H. R 3286 which would authorize FPC to prescribe safety requirements for natural gas companies. Bill, referred to Committee on Interstate and Foreign Commerce, would authorize FPC to prescribe rules for construction, extension, operation and manufacture of pipeline transportation facilities of natural gas companies as, in its opinion, are necessary for promotion of safety.

And another one, too

This bill, introduced by Rep. John B. Bennett (R.-Mich.) would grant FPC authority to require natural gas companies to extend their transportation facilities into areas not being served. Measure provides that FPC can make extension mandatory if it determines that pipeline has the gas available, or can get it easily, and that the demand factors in the area make extension of lines economically feasible.



Utilities tell us, **"this one really works"**



Oronite Odorometer

Gas companies say our Odorometer is by far the best way to test odor character and intensity. It offers utilities a simple means to check on the intensity of gas at given points in their system and keep accurate day-to-day records. Why not see a demonstration of the Odorometer? Call any Oronite office.

ORONITE ODORANTS. Oronite supplies the gas industry a complete line of dependable odorant products. Knowing many applications are different, Oronite is always willing to adapt odorant products to individual needs. Why not talk over your requirements with Oronite?

ORONITE CHEMICAL COMPANY

A CALIFORNIA CHEMICAL COMPANY SUBSIDIARY

EXECUTIVE OFFICES • 200 Bush Street, San Francisco 20, California

SALES OFFICES • New York, Boston, Wilmington, Chicago, Cincinnati, Cleveland, Houston, Tulsa, Los Angeles, San Francisco, Seattle

Foreign Affiliate: California Chemical International, Inc., San Francisco, Geneva, Panama

5194

COMPARE

ANY other odorants

with the CAPTAN line . . .

	CAPTAN	OTHER
1. 100% odorizing material *(no antifreeze diluent needed)*	✓	
2. Scientifically compounded *(for lasting uniformity)*	✓	
3. Of specially purchased ingredients *(from selected suppliers)*	✓	
4. In a special plant *(used exclusively for the production of gas odorants)*	✓	
5. Filter cleaned and dried *(to cloud point −20°F. max.)*	✓	
6. Packaged to suit your convenience*	✓	
7. Strategically warehoused for immediate delivery	✓	
8. Delivered **F.O.B. YOUR PLANT** *(our responsibility all the way)*	✓	
9. Supported by samples and laboratory reports *(retained at our plant for your further protection)*	✓	
10. Sold by odorization specialists whose only job is making regular, personal field calls to serve you.	✓	

ASK FOR THE NEW COMPLETE "ODORIZATION MANUAL BY CAPTAN"

* ½ to 1½ pound cans; extra-heavy, lined, distinctively labeled 5, 15, 55 gallon drums; the ONLY producer-owned, ICC certified mercaptan tank wagon, driven by an experienced odorant technician.

● *Don't delay . . . phone, wire or write us today!*

NATURAL GAS ODORIZING, INC.

P. O. BOX 15252 / HOUSTON 20, TEXAS

59-1

Regulatory and Legislative Trends

A COMMENTARY ON NATIONAL AND STATE DEVELOPMENTS BY AN EXPERT IN UTILITY LAW

Inflation forces utility rates up

UTILITIES have been exposed to a continuing increase in the prices for labor and material for so many years now that there is no present hope of keeping customer rates down. It is time to condition the regulatory commissions and ratepayers to the inflexible consequences of inflation, which will force utility rates up.

To illustrate, during 1950 12 state commissions authorized $11 million in electric rate increases, and last year 12 commissions granted more than $58 million in rate increases for electric service. Twenty-nine commissions approved gas rate increases of $10 million in 1950, and last year 24 regulatory agencies permitted $60 million in gas rate increases. Applications by pipeline companies to FPC for natural gas rate increases totaled $226 million in 1957. Telephone rate increases granted during 1957 amounted to $109 million. All of this action points to the rise in the cost of rendering utility service in the last seven years.

• Inflation is tenacious

Experts expect more inflation. Even during the recent recession prices moved higher. The federal deficit was less than $3 billion in June 1958. It is estimated to be $12 billion in 1959, and deficits ranging from $5 to $10 billion are expected for the followng three years. The Index of Wholesale Prices Other Than Farm Products and Food jumped 4 per cent in 1956 and another 3 per cent during 1957. Labor leaders, with myopia, demand and obtain annual wage increases beyond any increase in productivity. Higher prices for all of the ingredients in utility service will be the yeast for the coming rise in rates.

Up to now the increases in utility rates to customers have been far behind the rise in the cost of living experienced by those same customers since World War II. Utilities, however, are feeling the shock from being hit by inevitable inflation. The only direction that the price for utility services can go is up.

One fierce financial fact is that the cost of utility plant and equipment has shown a continued higher rise than the industrial wholesale price index. In the postwar period when the wholesale price index rose 21 per cent, the cost of steel gas mains jumped 68 per cent, and the cost of electric transmission plant climbed 61 per cent.

At these rapidly advancing costs public utilities, since the close of World War II, have been required to make greater expenditures each year for additional and improved service. The contrast between utilities and other industries is noteworthy.

Expenditures for New Plant and Equipment—1957

	(thousands)
Electric companies	$3,679,000
Petroleum and coal products	3,453,000
Natural gas companies	2,010,000
Telephone companies	1,760,000
Chemicals and allied products	1,724,000
Primary iron and steel	1,722,000
Railroads	1,396,000
Food and beverages	850,000
Paper and allied products	811,000
Stone, clay and glass products	572,000
Textile mill products	408,000
Rubber products	200,000

• Rate-making should allow for inflation

Alert managements and farsighted commissions have developed rate-making techniques to allow for the effects of inflation. Sometimes the rate base is employed for the purpose and many times the adjustment is made through the allowed rate of return.

A major reflection of the effects of inflation is the regulatory trend toward giving weight to current costs in determination of the rate base. During 1958 that was done in Minnesota and Missouri and reaffirmed in Alabama. Currently some consideration is given to reproduction cost in rate base determination of the states of Alabama, Arizona, Delaware, Illinois, Indiana, Iowa, Maryland, Minnesota, Missouri, Montana, New York, North Carolina, Ohio, Pennsylvania and Texas.

In both the Alabama and Missouri cases the fair value issue was decided by the state supreme courts. In the Alabama decision, the court stated that the Alabama statute provided for rates to enable the utility to earn a fair return on the reasonable value of its property. The court rejected both the company's contention that reproduction cost is the sole measure of value and the lower court's holding that it is the controlling element in fixing reasonable value. The Alabama statute provides that in arriving at the

value of the property used in the rendition of service the commission shall give due consideration to the history and development of the utility and its property, original cost, reproduction cost and other elements of value recognized for rate-making purposes. The "due consideration" required to be given these elements means more than the receipt in evidence of cost of reproduction and its rejection as the commission did in the instant case. The commission was held to have erred, therefore, in using a net investment rate base.

The Missouri court reversed an order fixing water rates because the commission used a net cost rate base and gave no consideration to evidence relating to present fair value. It held that in requiring that the commission give due regard to return on equity capital actually expended, the statute simply requires consideration of this factor and "is not preclusive of other relevant factors." The court ruled that the fair value of the property, which the commission is empowered to ascertain, is a relevant factor for consideration in establishing reasonable rates and must be considered in its proper relationship to all other facts. The court stated:

"The decreasing purchasing power of the American dollar, especially since the close of World War II, is a matter of common knowledge to owners and users of property and consumers of goods and services. Courts also know these facts and give such consideration to them as, in justice, they should—so, too must rate-making agencies—."

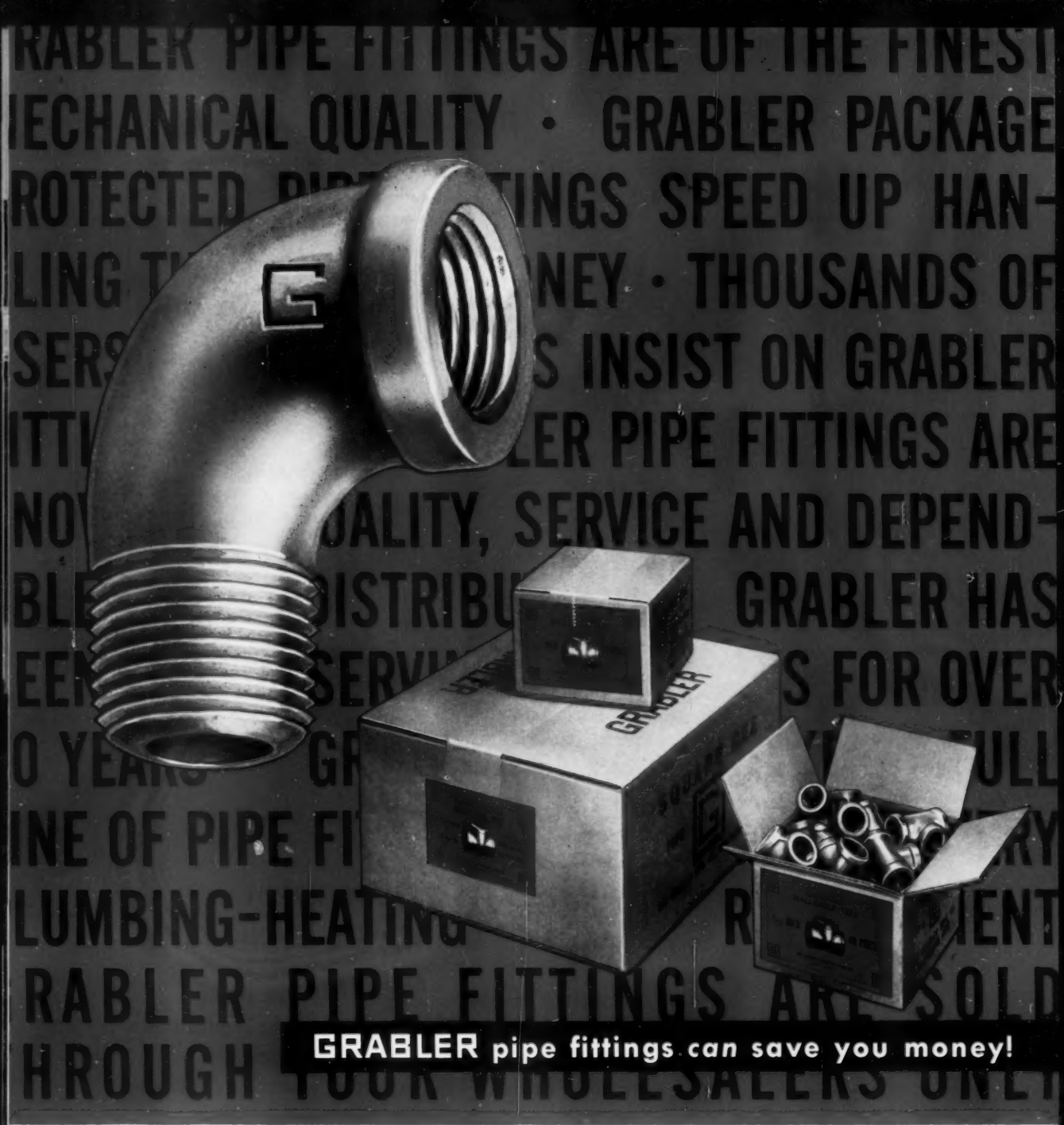
The court recognized that determination of fair value involves vexing problems of proof. It stated, however, that "once original cost is ascertained, modern bookkeeping methods used in connection with recognized trending percentage tables and price indices can be used to establish both reproduction costs and depreciation with reasonable accuracy."

The Minnesota commission decided one of the first rate proceedings in the state which took into account a 1957 statute requiring the commission to "give due consideration to evidence of the cost of the property when first devoted to public use, prudent acquisition cost to the telephone company less depreciation on each, and current values." The term "current value" is not capable of precise or specific definition, the commission stated. The term means the value of the company's property expressed in present dollar values or at the present level of prices. Testimony included replacement costs less depreciation, current costs less depreciation, and trended historical costs. Referring to buildings, the commission defined the term "current value" on the basis of what it would cost at the current price levels to replace the building, or its service, with a building at least equally satisfactory and comparable, less depreciation. With respect to equipment and material, the commission felt that the determination of current value was simpler, because market prices were available.

To compensate for the known shrinkage in the rate of return, as the cost of doing business soars, some commissions have made an additional return allowance above the amount considered a reasonable average. Then the realized return becomes the fair return for the future. Higher cost of money and other effects of inflation have been recognized too. For example, the California commission noted that a gas company's bonds cost 3.2 per cent in 1954 and that a comparable issue cost 4.6 per cent in 1957. This influenced the commission in changing the allowed return from the old 6 per cent to the new 6.5 per cent on the property. The California commission reasoned thus:

"The applicant is faced with a continuing construction program of substantial proportions to meet the needs and lawful demands of its customers which this commission requires applicant to meet." * * * "Analysis of applicant's earnings over the past several years discloses a definite and constant decline in its rate of return to the point that applicant seldom, if ever, has been able to earn the rate of return heretofore found by this commission to be fair and reasonable." * * *

". . . applicant, with Southern California Gas Company, has completed and put into operation new pipeline facilities needed to transport the additional out-of-state gas supply. These new facilities and other major improvements represent a large expenditure of new capital with a resultant depressing effect upon rate of return unless recognition is given to the actualities. These new facilities will be in operation during the full first year after the rates authorized by this decision are in effect, and, without establishing any precedent, the commission is of the opinion that the effect on rate of return of the new pipeline and other facilities heretofore constructed, and placed in operation during the test year 1957 should, in equity and justice, be considered. This can be done by recognizing and allowing for a substantial down trend in the rate of return, which we estimate to be 0.63 per cent. We will therefore set the rates at a level which would have shown a rate of return of 7.13 per cent on the adopted results for the test year 1957 as shown on Table 1, and which should enable applicant to earn a 6.5 per cent rate of return in the immediate future. Such rate of return we find fair and reasonable for the future." ■



You owe it to yourself to take advantage of the many cost saving factors Grabler pipe fittings offer. Grabler fittings come to you in easy to handle cartons plainly marked. They are easier to stock and use. Packaging keeps them clean and instantly useable. Start saving money by standardizing with Grabler package protected pipe fittings.

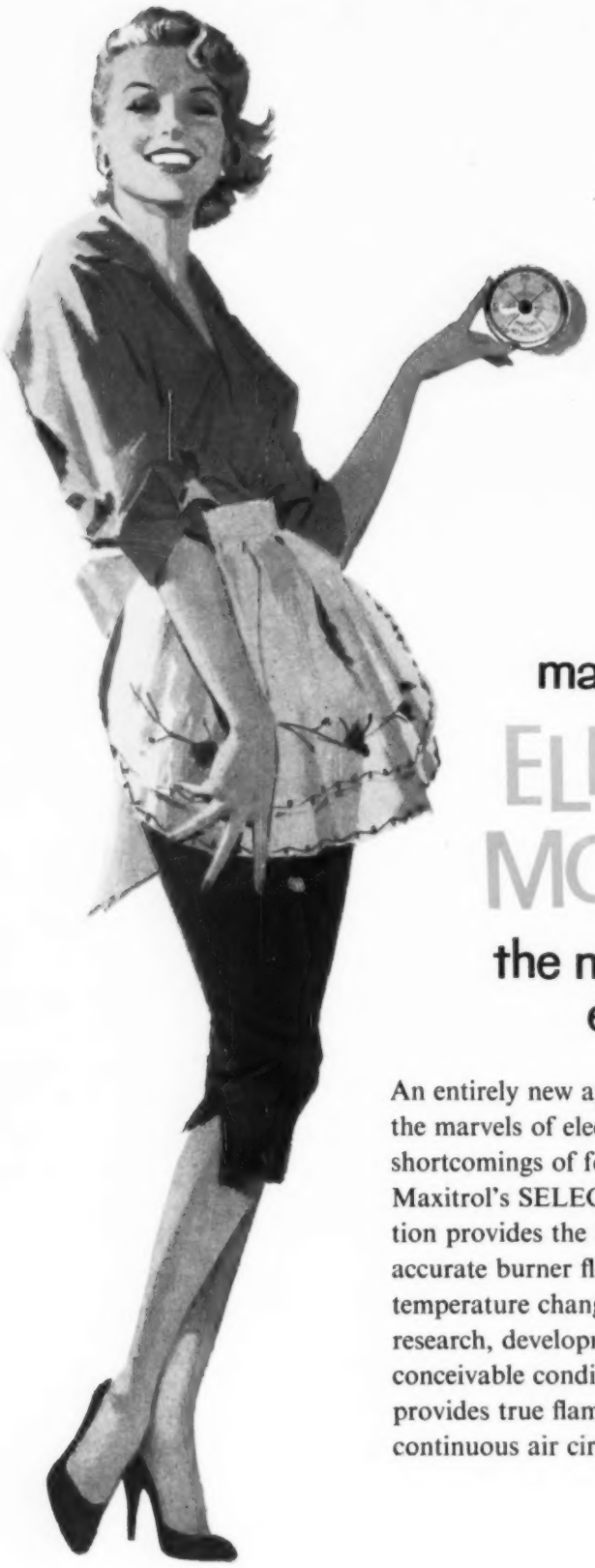
Warehouses Providing Dependable Service to Wholesalers

New York • Philadelphia • New Orleans
Atlanta • Pittsburgh • Cincinnati • Dallas
Chicago • St. Louis • Detroit • Denver
Minneapolis • San Francisco • Los Angeles

GRABLER SQUARE "GEE" PIPE FITTINGS

ORDER A SUPPLY FROM YOUR WHOLESALER TODAY

The GRABLER Manufacturing Co. • 6565 Broadway • Cleveland 5, Ohio



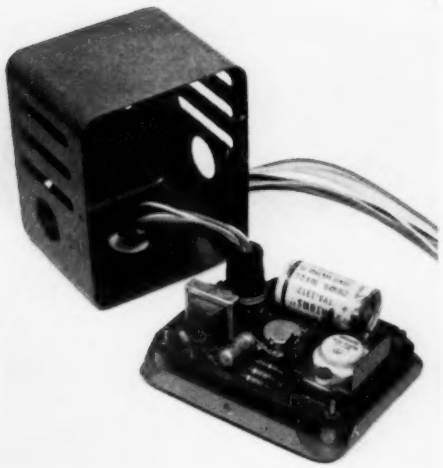
Key to SELECTRA is the tiny thermistor contained in the wall control. It reacts instantly to temperature changes.

maxine introduces...

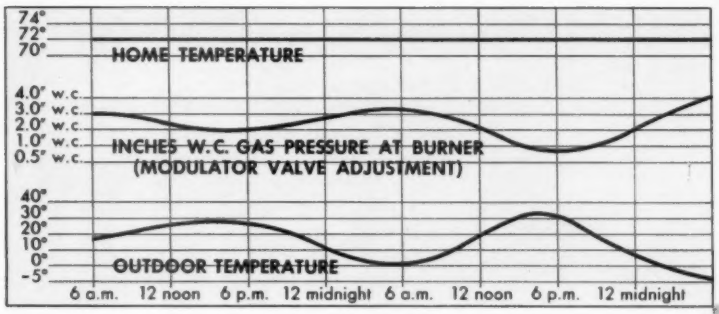
ELECTRONIC MODULATION

the new concept in even, non-cyclic heat

An entirely new approach to modulation through the marvels of electronics, overcomes the fundamental shortcomings of forced air heating systems. Maxitrol's SELECTRA system of electronic modulation provides the heating system with instantaneous, accurate burner flame adjustment in response to temperature change. The result of five years of research, development and testing under every conceivable condition, the SELECTRA System provides true flame modulation and permits continuous air circulation.

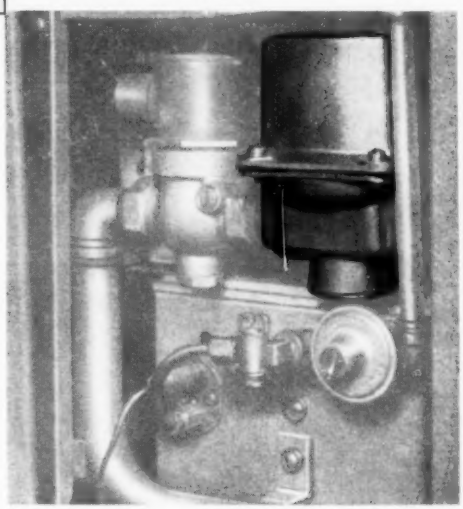


Printed amplifier circuit and plug-in type circuit board means lower cost, longer life and easy servicing. The signal current from the thermistor circuit must be amplified before it can perform the work of operating the modulator valve. The SELECTRA system does this with the latest advancements in electronics.



SELECTRA'S even, non-cyclic heating is clearly demonstrated by the representative sample of curve characteristics shown on the chart. Heat loss caused by falling outdoor temperatures is immediately sensed and the burner input changes to balance the loss. The modulated flame coupled with continuous air circulation, keeps the home at an even, comfortable temperature.

Straight-thru-flow modulator valve employs the Maxitrol conical valve which keeps pressure drop at a minimum. The valve serves the dual function of modulation and pressure regulation. The current from the amplifier circuit operates the solenoid power head of the modulator valve which controls the burner flame adjustment through a range from the lowest point at which the burner will operate properly—up to full fire.



MAXITROL *Selectra* SYSTEM OF ELECTRONIC MODULATION

MAXINE SEZ,

"Drop me a line and I'll send you a free 8-page catalog with complete details on the SELECTRA SYSTEM."

MAXITROL COMPANY • 12200 BEECH ROAD • DETROIT 39, MICHIGAN

reduce corrosion

...use MUELLER®

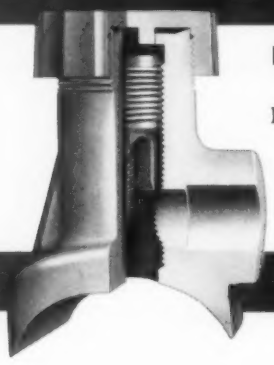
Tees and Curb Stops with insulating couplings

Mueller Tees and Curb Stops with insulating couplings effectively insulate the service line at the main and at the curb. This permits the use of dissimilar metals, such as copper service pipe, with a steel main. Electrical bond is broken at convenient points and corrosion is reduced.

Check corrosion in existing systems by replacing present curb stops with Mueller Cutting-In Curb Stops which have insulating couplings.

Mueller Tees and Curb Stops with compression couplings for steel pipe can be converted to insulating couplings for copper pipe by using a Mueller Insulating Adapter Gasket.

This detail of design greatly simplifies the ordering and inventory of tees and stops. It is typical, however, of the attention to detail in research, design and engineering that becomes a part of every Mueller product produced for the gas industry.



MUELLER PLASTIC TEES

. . . permit fast, safe service connections to plastic pipe. Tee is solvent-welded to main and service line. Main is then drilled under pressure by rotating built-in cutter. Cutter retains coupon and backseats against "O" ring in top of tee to prevent leakage. The tee includes a valve for future shut-off.

GEM

NO-BLO®

MUELLER CO. **DECATUR, ILL.**

Factories at: Decatur, Chattanooga, Los Angeles.
In Canada: Mueller, Limited, Sarnia, Ontario

ALL NEW

FROM FORD

FOR '59

FORD'S

THE LINE FOR '59

Get detailed information on:

NEW FORD 10 Ft., 12 Ft., 14 Ft., BACKHOES

NEW FORD INDUSTRIAL TRACTOR

NEW FORD SUPER-DUTY LOADER

NEW FORDSON POWER MAJOR DIESEL

SEE YOUR FORD TRACTOR AND EQUIPMENT DEALER TODAY

or write to Industrial Sales Department, Tractor and Implement Division, Ford Motor Company, Birmingham, Michigan.

YOU SEE MORE

FORDS

BECAUSE THEY SAVE MORE MONEY!

COPYRIGHT 1959, FORD MOTOR COMPANY

ALL FORDS ARE ENGINEERED FOR:

- ***Fast Digging***
  Long reach, free drop, unmatched bucket capacities, positive swing and boom control, Ford's exclusive placement of pivot points and hydraulic cylinders—all work together for faster production and greater lengths of trench from a single setting.
- ***Precision Digging***
  Instant, accurate control of boom, dipstick and bucket lets you hold trench floors to exact grade, dig plumb walls and square corners, work around underground lines, reduce costly hand finishing.
- ***Problem Digging***
  Wide-stance stabilizers and full-power 185° swing are among the many superior Ford features which help you undercut paved surfaces, dig at full speed on slopes or at right angles, work close to buildings, in cramped quarters, on soft ground.

FORD 10 FT. BACKHOE

Dimensional specifications with Ford Workmaster Tractor

Transport length: 17′1″

Transport height: 10′4″

Seat to ground: 54″

Axle to swing post: 3′2″

Max. reach from axle: 17′4″

Reach, pivot to bucket teeth: 14′2″

Max. undercut forward of pivot: 5′7″

Reach outside tire @ 90°: 11′6″

Hydraulic pump capacity: 14 gpm @ 1700 rpm

Stabilizer, lift, bucket and crowd cylinders (double acting): piston 3″ dia., rod 1¾″ dia.

Swing cylinders (single acting): piston 3½″ dia., rod 1½″ dia.

Features offered by all Ford 10′, 12′ and 14′ backhoes are listed on last page.

FORD 10 FT. COMPARISON CHART

FEATURE	FORD 10′	BACKHOE A	BACKHOE B
Max. length 40″ excavation	**14′3″**	11′1″	11′
Max. digging depth	**10′8″**	9′8″	9′8″
Max. reach from swing post	**14′2″**	12′4″	13′
Max. swing	**185°**	140°	180°
Max. loading height	**9′5″**	7′4″	8′6″
Ground clearance	**13½″**	10″	6″
Max. stabilizer spread	**120″**	78″	83″
Min. stabilizer spread (transport)	**77″**	77″	84″
Approx. weight (installed with bucket)	**2397 lbs.**	2110 lbs.	1725 lbs.
Struck capacity (cu. ft.)			
12″ ditching bucket	**2.5**	2.3	1.75
18″ ditching bucket	**4.5**	3.2	2.75
24″ ditching bucket	**6.0**	4.5	3.75

INTEGRATED HYDRAULIC PACKAGES

Ford backhoes use an integrated hydraulic system with front-mounted loaders; or are supplied with separate pump, drive and reservoir for tractors without loaders:

1. Ford 10′ Backhoe with Ford Extra Heavy Duty Loader on Ford NAA, 600, 601, 800 and 801 Tractors.
2. Ford 10′ and 12′ Backhoes with same loader on same tractors, but with bigger pump.
3. All Ford Backhoes with or without Ford Super-Duty Loader on Ford Industrial Tractors.
4. All Ford Backhoes without loader on Fordson Major Diesel and Fordson Power Major Tractors.

ALL FORDS ARE ENGINEERED FOR:

- ***5-Minute "Quick Hitch"***

  Ford has a clamp-type hitch, uses no pins or bolts. One man can put the backhoe on or off in minutes, right on the job. It takes no special tools or equipment. There's no interference with Ford's 3-point hitch. It's ready for work with commonly used rear tools as soon as the backhoe is removed.

- ***Unmatched Stability***

  Ford stabilizers are 10′ apart when working—widest stance on the market. Stabilizers retract without manual adjustment to 77″ width, carried high and close to tractor tires for transport and front loader work. Choice of five stabilizer plates—standard, sand, spike, street and special cemetery.

- ***Cushioned "No Drift" Swing***

  Short, single-link control of boom pivot helps keep swing system snug fitting, prevents swing drift. Automatic braking prevents slamming load into extreme swing limits in normal operations.

FORD 12 FT. BACKHOE

Dimensional specifications with Ford Powermaster Tractor

Transport length: 16′10″
Transport height: 11′5″
Seat to ground: 54″
Axle to swing post: 3′2″
Max. reach from axle: 19′
Reach, pivot to bucket teeth: 15′10″
Max. undercut forward of pivot: 5′10″
Reach outside tire @ 90°: 13′1″
Hydraulic pump capacity: 14 gpm @ 1700 rpm
Stabilizer, lift and crowd cylinders (double acting): piston 3½″ dia., rod 2″ dia.
Bucket cylinders (double acting): piston 3″ dia., rod 1¾″ dia.
Swing cylinders (single acting): piston 4″ dia., rod 1½″ dia.

FORD 12 FT. COMPARISON CHART

FEATURE	FORD 12′	BACKHOE C	BACKHOE D	BACKHOE E	BACKHOE F	BACKHOE G	BACKHOE H
Max. length 40″ excavation	**16′3″**	13′2″	11′	11′	12′4″	12′11″	11′8″
Max. digging depth	**12′5″**	11′	11′5″	11′5″	12′7″	11′6″	12′
Max. reach from swing post	**15′10″**	15′11″	13′10″	13′10″	15′7″	15′5″	14′4″
Max. swing	**185°**	180°	140°-180°	180°-200°	180°	180°	188°
Max. loading height	**10′7″**	10′	8′2″	7′11″	9′1″	7′5″	9′11″
Ground clearance	**13½″**	11″	10″	10″	N.A.	10″	12¾″
Max. stabilizer spread	**120″**	95″	86″	86″	102″	110″	98″
Approx. weight (installed with bucket)	**2685 lbs.**	N.A.	1900 lbs.	1900 lbs.	2095 lbs.	2969 lbs.	3001 lbs.
Struck capacity (cu. ft.)							
12″ ditching bucket	**2.5**	2.5	2	2	2	2	2
18″ ditching bucket	**4.5**	4	3	3	3.5	3.25	3.5
24″ ditching bucket	**6**	5.5	4.5	4.5	5	4.5	5

FORD 14 FT. BACKHOE

Dimensional and performance specifications with Ford Industrial Tractor

Transport length: 18′4″
Transport height: 12′7″
Seat to ground: 54″
Axle to swing post: 3′2″
Max. reach from axle: 20′8″
Max. undercut forward of pivot: 5′10″
Reach outside tire @ 90°: 14′10″
Hydraulic pump capacity: 16.4 gpm @ 1700 rpm
Stabilizer and bucket cylinders (double acting): piston 3½″ dia., rod 2″ dia.
Lift and crowd cylinders (double acting): piston 4″ dia., rod 2¼″ dia.
Swing cylinders (single acting): piston 4½″ dia., rod 2″ dia.
Max. length 40″ excavation: 16′2″
Max. digging depth: 14′1″
Max. reach from swing post: 17′6″
Max. swing: 185°
Max. loading height: 11′8″
Ground clearance: 13½″
Max. stabilizer spread: 120″
Min. stabilizer spread (transport): 77″
Approx. weight (installed w/bucket): 2905 lbs.
Struck capacity (cu. ft.)
12″ ditching bucket: 2.5
18″ ditching bucket: 4.5
24″ ditching bucket: 6.0
24″ high capacity ditching bucket: 7.0

NO **FORD 14 FT. COMPARISON CHART**

(there's never been anything approaching this model short of big expensive equipment)

ALL FORDS ARE ENGINEERED FOR:

- ***Four Major Lift Advantages***
  1. Power from largest side of piston on lift, when meeting most resistance.
  2. Straight-up transport position, better stability.
  3. Excellent dump height.
  4. Unmatched reach for undercutting forward of tractor rear axle.

- ***Four Major Crowd Advantages***
  1. Power from largest side of piston on crowd, when meeting most resistance.
  2. Excellent leverage provided through entire crowd stroke.
  3. Directs resistance force back to heavy boom, not to dipper stick.
  4. Permits combination of work actions for efficient, faster digging.

- ***Four Major Curl Advantages***
  1. Power from largest side of piston when curling bucket through ground resistance.
  2. Precise bucket positioning.
  3. Maintains high average tooth force during bucket rotation.
  4. Clean sweep action; no interference; no heel drag.

No matter what kind of HOLE, consider the WHOLE . . .

HERE ARE 55 EXCELLENT REASONS WHY A FORD BACKHOE WILL DO YOUR JOB BEST!

Quick Hitch

1. Close-coupled for good balance, stability.
2. Clamp-type hitch; no pins or bolts.
3. One man puts on or off in 5 minutes; no special tools.
4. Self-storing unit.
5. No need to disconnect pump drive; just connect uncoupled lines together and oil recirculates.
6. No interference with 3-point hitch; always ready for action.

Cool Hydraulic System

7. Clean design, shortest possible lines, no sharp bends. All help keep oil cool.
8. Ample oil capacity to provide full flow, maximum cycle speeds, and to prevent pump cavitation.
9. Six-spool multi-purpose body valve for top speed cycling, positive control, excellent throttling.
10. Main relief valve backed up by separate relief valves in hydraulic lift and crowd circuits.
11. No pipe, pipe threads or pipe fittings; all straight threads with "O" rings or tube fittings. Tight seal, easy service.
12. Minimum number of hose sizes to simplify owner maintenance.
13. All lines short as possible to reduce friction power losses.
14. Double acting cylinders throughout except for single acting swing cylinders.
15. All cylinders positioned for maximum force during stroke of greatest resistance.
16. Chevron type packing with phenolic resin back-up rings.

Rugged Construction

17. Backed up by Ford service warranty; one-stop parts and service; traditional good trade-in value.
18. Large replaceable pivot pins and case-hardened bushings at all wear points.
19. Hydraulic lines inside box members for protection where possible.
20. Control shroud cover easily removed to service plumbing.
21. Heavy duty swing post is shock resistant malleable iron casting.
22. Main swing pivot pins 1¾" dia.; special thrust washer in upper bearing resists wear from boom swing.
23. Boom, dipper stick and stabilizer arms all welded high strength box sections for maximum brawn, minimum weight.
24. Box section reinforcements at main pivot points of swing post, boom and dipper stick.

Operator Convenience

25. All models have adjustable, full-cushioned seat with back rest.
26. Plenty of leg room on anti-skid deck.
27. Superior work visibility.
28. Easy to reach tractor throttle, loader controls, etc. from seat of backhoe.

Unmatched Stability

29. Widest stabilizer stance on market.
30. Narrowest stabilizer transport width on market.
31. Individual control of stabilizers for leveling on slopes, uneven ground.
32. Wrist action pivot between each arm and stabilizer pad gives full ground contact.
33. Choice of five stabilizer pads to adapt for any type of work.

Superior Lift

34. Hydraulic power from big end of piston on lift stroke, when boom meets greatest resistance.
35. Free fall for speed and breaking ground.
36. Straight-up boom transport; closer to tractor center of gravity for stability.
37. Unmatched dump height.
38. Unmatched undercutting capacity.

Superior Crowd

39. Hydraulic power from big end of piston on crowd stroke, when dipstick meets greatest resistance.
40. Crowd force directed to lower end of dipper stick, near bucket pivot.
41. Cylinder location gives excellent leverage.
42. Resistance force transferred to heavy boom, not to dipper stick.
43. Crowd advantages are a vital part of Ford's over-all digging efficiency, permit faster production.

Superior Curl

44. Four-bar actuating linkage gives precise bucket positioning.
45. Hydraulic power from big end of piston when curling teeth through greatest resistance.
46. Maintains high average bucket tooth force.
47. Clean sweep action; no interference; no heel drag.

Biggest Bucket Capacities

48. Choice of 12", 18" and 24" standard ditching buckets; 24" high capacity ditching bucket for 14' model; 32" and 36" bell hole and cemetery buckets.
49. Replaceable wear points on teeth; bucket mouth flared to reduce friction.

Superior Swing

50. Positive, instant control; no delay getting bucket back into trench for another payload.
51. Fine throttling or feathering of swing control valve.
52. Combination flow and cushion valve maintains a solid oil circuit, prevents drifting.
53. Short, single-link connection between each cylinder and swing post; no chain or cable to wear excessively.
54. Short linkage reduces number of pivot points to four.
55. Retarding device on swing control lever automatically brakes swing to prevent slamming into stops. Operator can over-ride to get maximum swing.

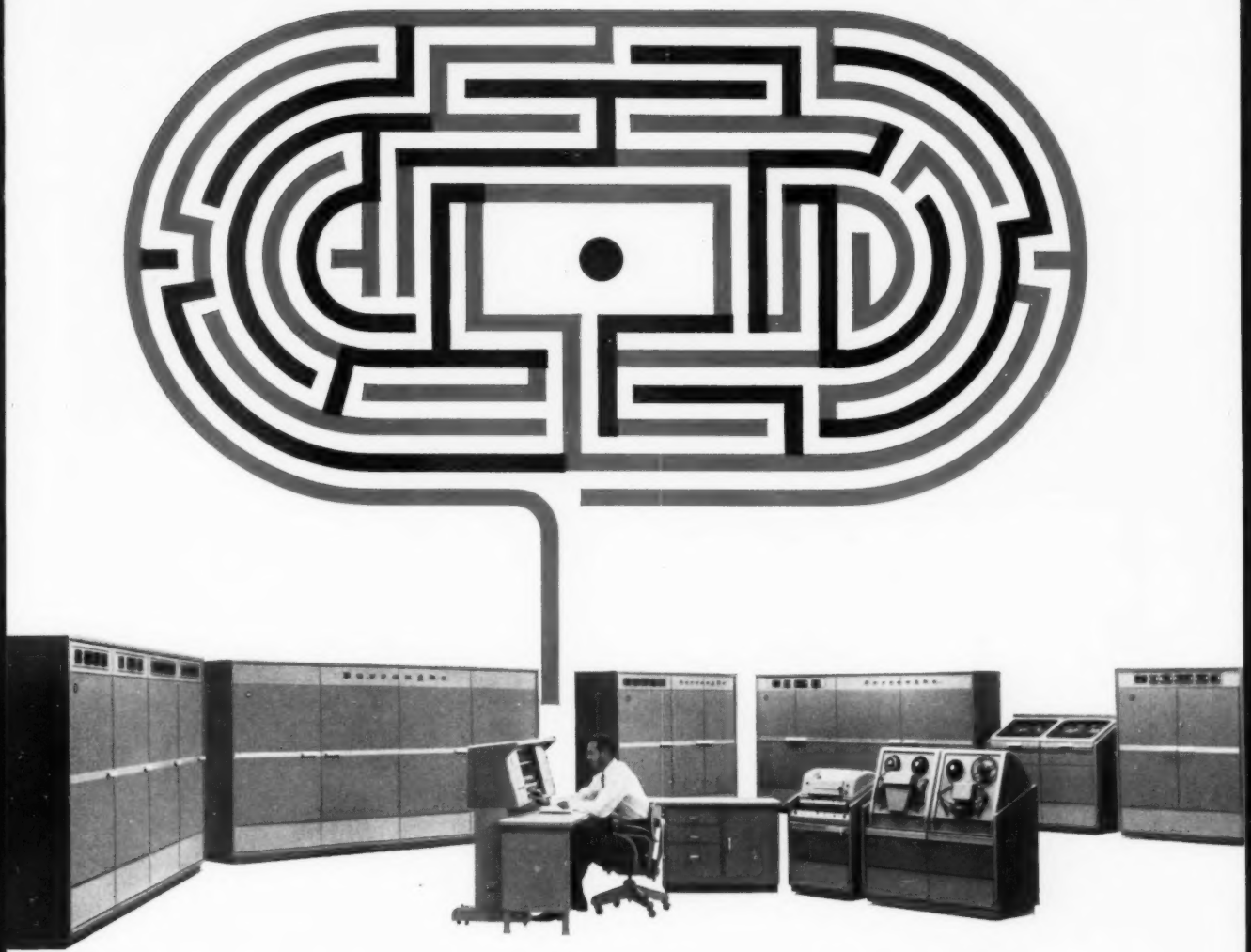
Ask your Ford Tractor and Equipment Dealer for more detailed specifications and literature on these new backhoes as well as for all the other new tractors, loaders and matching equipment in Ford's new line for '59. See him today, or write to Ford Motor Company, Industrial Sales Department, Birmingham, Michigan.

YOU SEE MORE
FORDS
BECAUSE THEY SAVE MORE MONEY!

Design, materials and/or specifications are subject to change without notice and without liability.

DXM-6998 159125

PRINTED IN U.S.A.

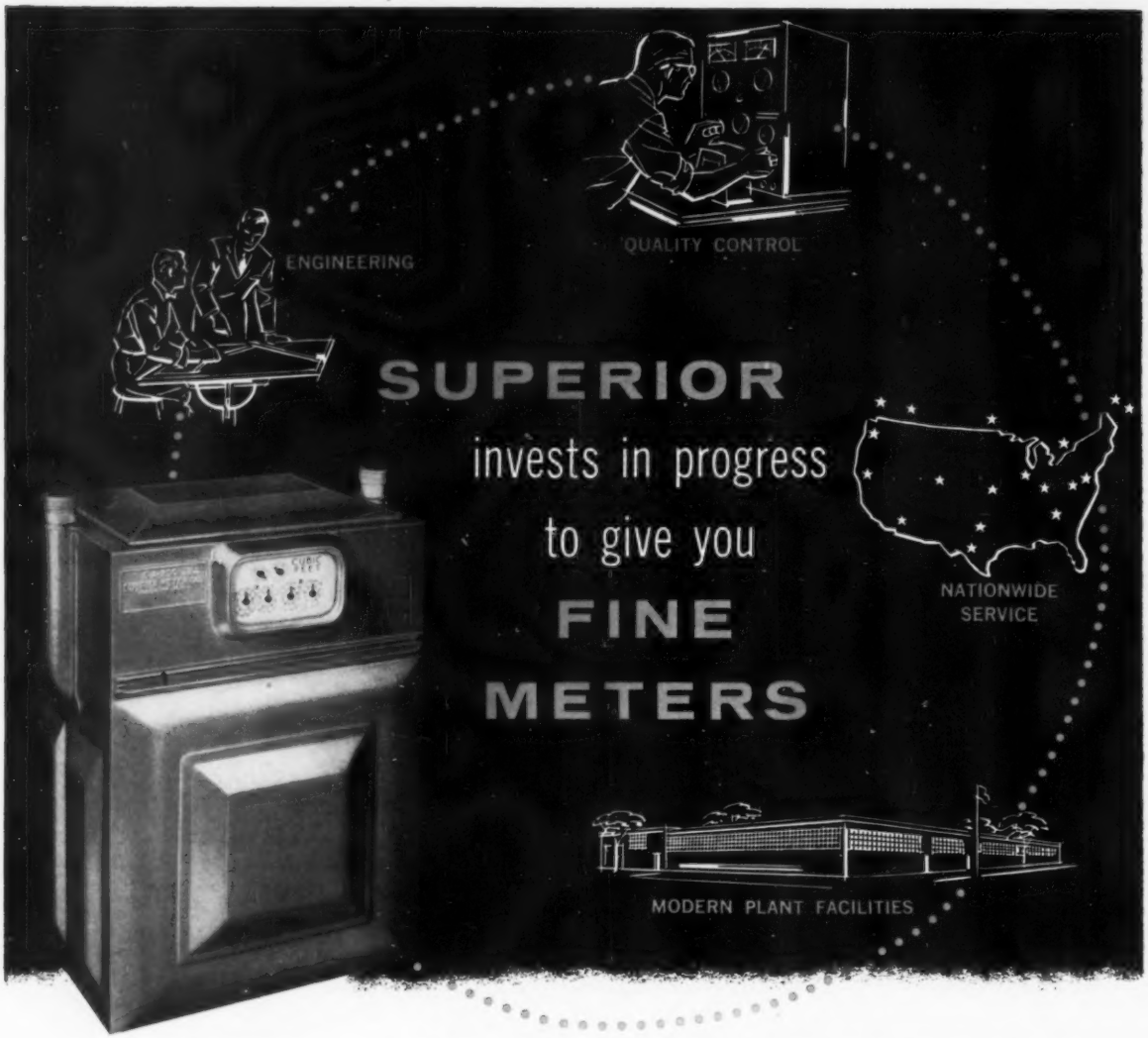


solving today's problems today: Burroughs 220 Computer

In scientific computation and business data processing, the new Burroughs 220 is delivering tangible results today. Linking a powerful digital computer to equally powerful input-output subsystems, the 220 offers balanced performance at the lowest application cost. Its expandable core memory, built-in floating decimal arithmetic, vast Datafile magnetic tape capacity and the multiple-card processing ability of Cardatron make this the most powerful system available in the medium price field. The 220 is just one part of a complete line of advanced Burroughs electronic data processing equipment...now in production...now at work in hundreds of installations...supported by an outstanding team of computer specialists. Write today for 220 brochure, ElectroData Division, Pasadena, California.

Burroughs Corporation

"NEW DIMENSIONS/in electronics and data processing systems"



A larger staff of respected meter engineers...quality control specialists...nationwide sales and service... modern, high-precision machine tools... a brand new plant turning out the advanced-design Superior aluminum case meter, also the well-known tin case meters... that's the Superior Meter Company of today, now part of Neptune Meter Company, one of the world's major meter and instrument groups.

For Superior customers this means meters of sustained, fine-instrument accuracy, the result of one of the finest combinations of men, methods and machines. It also means a representative in your area who understands your needs and gives you service when you want it.

You now get more, at no extra cost, when you specify "Superior", the meter of enduring accuracy.

For Quality Meter Repairing and Repair Parts...
Superior maintains meter repair shops with rigid standards of quality control as an addition to your own facilities. Write or phone today.

SUPERIOR METER COMPANY, INC.
19 West 50th Street, New York 20, N. Y.
A SUBSIDIARY OF NEPTUNE METER COMPANY

Branch Offices: Atlanta • Boston • Chicago • Dallas • Denver • Los Angeles Louisville • New York • North Kansas City, Mo. • Philadelphia Portland, Ore. • San Francisco

In Canada: Neptune Meters Ltd. • Toronto • Calgary • Halifax Montreal • St. John • Vancouver • Winnipeg

neptune

16

Technical Trends

By GUY CORFIELD

In-situ combustion for oil recovery

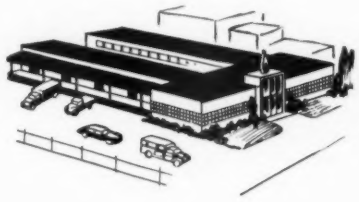
Increasing attention is being given to "secondary recovery" of oil remaining in underground formations after normal production by flow and pumping. The oil not ordinarily recoverable may be as much as 50 per cent of the total in an underground reservoir. Repressuring by gas and "driving" by water pumped down injection wells are two means that are used with some success. There has been some consideration of "mining" whereby shafts and tunnels would be driven into the formation and the seepage of oil pumped to the surface. Another means that has been actively explored in this country for the past six years is in-situ combustion.

In-situ combustion is relatively simple to visualize, but obviously difficult to control. Air, or a mixture of air and gas, is pumped down one or more injection wells and moves toward the production wells to form an underground gas-air pocket. This mixture is ignited at the bottom of the injection well by one of several methods such as electric heaters, gas burners, or readily oxidized chemicals (such as phosphorous). Air injection is resumed and the burning "front" moves slowly toward the production wells.

Fuel is provided by the in place oil itself. As heat moves forward ahead of the burning front, it cracks some of the oil to leave a carbonaceous residue which provides fuel. Also, as the burning front progresses it leaves behind clean hot sand which preheats the injection air to further aid combustion. Temperatures in the order of 1200 degrees F are developed.

As heat and pressure penetrate, three effects are produced: (1) water accompanying the oil is converted to steam and this steam, with additional water vapor from combustion, is pushed forward into cooler strata where it condenses back to water and, in effect, acts as a water drive; (2) some oil is mildly cracked to lighter hydrocarbons which are more fluid and also have a solvent action on the forward heavy oil; and (3) uncracked oil is heated to increase its fluidity or mobility. The net result is an increase or commencement of oil flow from the production wells as a combustion front approaches. This continues for some time even after combustion is stopped because of the residual underground heat.

Thirteen different experimental in-situ combustion projects have been, or will soon be, started in the U. S. It appears that this process for tapping exhausted oil fields will be economic in the relatively near future as methods and controls improve. It promises to be the best of secondary recovery methods. There is also considerable thought being given to *underground nuclear blasts* for this same purpose. Recent experiments at the Nevada nuclear test site have indicated that atom bombs can be exploded underground in a controlled manner. They will, of course, develop tremendous heat and pressure. Equally as important, the dangerous radioactive by-products can be contained and trapped harmlessly in a relatively small area. Oil companies are eager to try this means of creating underground heat and pressure not only for residual oil recovery, but also for generally similar effectiveness in U. S. oil shale areas and the Athabaska tar-sand deposits in northern Canada. So far, the international ban on further nuclear explosions has prevented these tests.



The plasma thermocouple

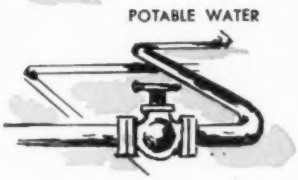
In the February 1959 issue of this page, under the heading "Cooling or Heating by Thermo-Electricity," the semi-conductor or semi-metal thermocouple was described. It has been hailed as a great improvement—in fact a major technical break-through—over the historical metal-to-metal thermocouple of many past years use. Already, however, there appears to be another advance through the development of the plasma thermocouple.

In this device, one side of the thermocouple is a metal or semi-metal or solid semi-conductor, and the other side is an *electrified gas* which is called a plasma. In a prototype recently described by the Los Alamos Scientific Laboratory, the metal was tantalum and the gas was cesium vapor. It operates at the relatively high temperature level of 4700 degrees F hot junction and 570 degrees F cold junction, to continuously produce electricity at a potential of about 2 v.

Plasma as used in this connection is one of the new words and concepts of the new science (or frontier of knowledge) termed Magneto-Hydro-Dynamics (MHD) Plasma is defined as a moving tenuous river of electrified gas (such as the cesium vapor already mentioned, or a jet of charged hydrogen atoms). According to MHD the earth's ionosphere, and outer space—which is apparently by no means empty—seethes with plasmas or "winds" of electrically charged particles, probably produced by influence of or eruptions on the sun and other stars, and flowing as storms or tides between them.

REMARKABLE *new* RIGID PLASTIC PIPE!

★ **Higher Tensile Strength**
★ **Higher Heat Resistance**



MADE OF

CYCOLAC® C ABS

ABS TYPE II
Thermoplastic Resin

(NSF APPROVED)

New Thermoplastic Resin from BORG-WARNER

Now there are two types of ABS rigid plastic pipe made of Cycolac, the *tough* thermoplastic. The original Borg-Warner Cycolac L ABS Type I resin has already proved its worth in scores of applications from coast to coast.

The new Cycolac C ABS Type II resin offers increased tensile strength, greater heat resistance and other important advantages over metal. Among these are light weight, ease of installation and protection against corrosion.

To users of pipe, Cycolac C offers superior service over a greater range of temperatures with increased chemical resistance.

WRITE FOR NAME OF YOUR NEAREST CYCOLAC EXTRUDER

PACESETTER IN
Marbon CHEMICAL
SYNTHETIC RESINS

DIVISION of BORG-WARNER
WASHINGTON, W. VA. • GARY, INDIANA
also represented by:
WEST COAST: Harwick Standard Chemical Co., Los Angeles, Cal.
CANADA: Dillons Chemical Co. Ltd., Montreal & Toronto
EXPORT: British Anchor Chemical Corp., New York

BW ® Marbon

WASHINGTON

By NEIL REGEIMBAL
GAS Washington Bureau

Court action instead of legislation

THE Eisenhower Administration has given up hope of solving any of the current problems involved in regulation of the natural gas industry by legislation.

Instead, executive branch officials are turning to the courts to try to evolve a workable method of regulation under the 1954 Phillips decision.

Unless this policy is sharply changed, it means certain death for the Harris bill and all others like it this year and in future years.

A top Republican member of the Federal Power Commission when asked said recently that he does not expect to see natural gas legislation pass.

"The Federal Power Commission will have to work out its own problems," he continued.

Although he insisted that "nobody (in the Administration) has told me what the White House will do," he put the cork in the jug later when he said he "presumes the Administration did not ask for (the Harris bill)."

As generally suspected, this source—certain to be one of the architects of the Administration's policies on natural gas legislation—hinted that should the Harris bill or similar legislation pass, the President would probably sign it.

The belief is growing in government circles that the bill is becoming less and less necessary because the opponents and proponents of this legislation within the industry itself are "coming closer and closer together" in what they believe are the solutions to the problems of regulation.

This belief, whether correct or not, is another factor which is helping to put legislation in its grave.

One official points out that persons opposed to freeing gas producers from utility-type regulation (as the Harris bill would do) are in effect trying to do the same thing in their arguments before the courts. The government itself is firmly opposed to utility-type regulation of producers, but now is in favor of developing regulations within the framework of the Phillips decision which would lift this type of regulation and still be upheld by the courts.

At the same time, the sponsor of natural gas legislation, Rep. Oren Harris (D., Ark.), has publicly restated what he privately made clear many times: There will be no gas bill unless the White House actively works for it. "If the Administration wants this bill, then it will have to come out foursquare for it," he says in a direct reference to the President's failure to mention gas regulation in either of his first three annual messages to Congress.

The new Harris bill is similar to last year's Harris-O'Hara measure approved by the House Commerce Committee (which Rep. Harris again heads). It would lift utility-type regulation from producers, permitting them a commodity-type rate base. It would also include the so-called "coal amendment" to institute regulation of off-peak sales.

It defines an off-peak sale as "only such sale in interstate commerce of natural gas as is made by a natural gas company after the commencement of the transportation of natural gas in interstate commerce . . . to a person who does not resell" it.

It would prohibit off-peak sales at less than a firm's commodity rate plus 50 per cent of its demand rate in the zone involved, or at less than 85 per cent of the average rate per unit during the preceding year to resale customers.

Politically, this would tend to gather support from the coal industry which has long chaffed at off-peak sales. But it has driven away some of the support the bill had in the past. While it would ease controls over producers, it would not erase them, and producers are lukewarm. Pipelines are contesting the coal amendment.

In brief, the new bill would continue new producer contracts under FPC control, permitting it to set a "reasonable market price," but would replace the present confusing tests of costs, cost of service, and the rest. It also forbids indefinite escalation clauses.

In an unusual political switch, there is a chance that the coal producing interest could actually be one of the strongest supporters of the Harris bill—not because they want to help producers, but because they want to kill off-peak sales. Coal labor and management both are smarting under a recent import tax on coal imposed by West Germany, a major customer of U. S. coal in the past few years.

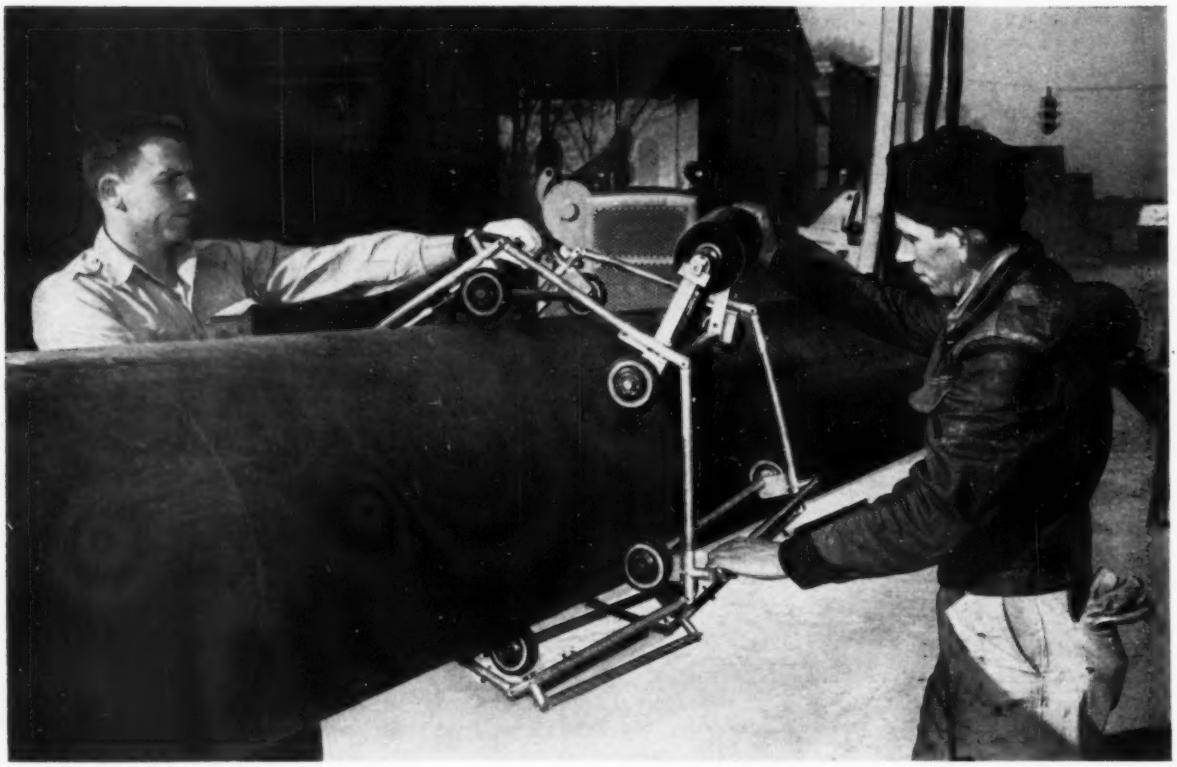
With coal costs tied closely to labor contracts, the coal industry is faced with finding new customers rather than softening the price of its product.

At the same time, this coal industry drive may also spell extra trouble for the already embattled gas and oil depletion allowance.

Continued on page 119

THE MODERN TAPE...AT WORK FOR MODERN INDUSTRY

20-inch gas main site-wrapped with versatile Polyken® tape



Upper New York State utility company turns to Polyken tape to get the job done fast...and sure...in congested areas

This is the tape that's making big-inch pipeline news this year. Made of tough, inert polyethylene, Polyken tape offers proven protection against the corrosive effects of moisture, soil chemicals and electrolytic current.

And here, on a site-wrapping job in a congested city area, it provides another major advantage: *simplicity of application.*

Tape saves headaches

You know the complications of using a hot coating in a place like this. Easy-to-apply Polyken tape does away with these problems. It goes on, as you see, right off the roll—without heat, liquids, solvents or thinners. Saves time, labor and equipment costs.

Now you know why more and more utility companies are turning to site or over-the-ditch wrapping for their distribution lines with time-tested, time- and money-saving Polyken tape.

For further information, write to the Polyken Sales Division, 309 W. Jackson Blvd., Chicago 6, Ill.

Polyken®

Experienced in modern PROTECTIVE COATINGS

THE KENDALL COMPANY
Polyken Sales Division

By MARSHALL E. PARKER

The prediction of leak rates—Part 3

IN preceding issues (September and November 1957) it was pointed out that the Logan-Scott-Ewing pit depth-area-time equation

$$P = k\,T^n\,A^n$$

could be modified into one using more conventional units, and predicting the number of leaks to be expected per mile of bare pipeline.

$$N = K\,D\,W^{-1/a}\,T^{n/a},$$

where

$$K = (3456)\,(1.887)^{n/a}\,(1000)^{-1/a}k^{1/a}$$

and

N = number of leaks per mile,
D = pipe diameter (actual) in inches,
W = wall thickness in inches, and
T = time, in 10-year units.

Now if we can express n, a, and k as functions of ρ, the soil resistivity, we shall be able to write the leak frequency prediction equation for a given section of pipe.

Table I gives the values, in the original units used, of these three variables and of the soil resistivity, for the 45 soils used in this study. Soils 6 and 31 were rejected, because the value of zero given for the constant n is mathematically meaningless. For reasons as set forth previously (June 1957) it is considered more reasonable to correlate the variables with the logarithm of the resistivity rather than with the resistivity itself.

TABLE I

Soil No.	Resistivity ohm-cm	n	a	k mils
1	1,215	0.49	0.146	58.5
2	684	.34	.131	45.4
3	30,000	.17	.144	68.8
4	6,670	.59	.160	51.6
5	1,346	.47	.144	37.0
7	2,120	.46	.116	31.1
8	350	.32	.133	64.4
9	2,820	.16	.172	44.0
10	7,460	.42	.184	37.2
11	11,000	.32	.140	62.9
12	3,190	.13	.140	51.2
13	290	.18	.198	63.7
14	3,520	.48	.158	85.5
15	489	.32	.100	51.4
16	8,290	.32	.118	66.0
17	5,980	.19	.125	33.1
18	1,410	.18	.111	46.0
19	1,970	.34	.103	51.9
20	2,870	.43	.188	34.7
21	2,370	.60	.129	55.7
22	5,150	.21	.028	57.7
23	278	.61	139	107.3
24	11,400	.11	.172	22.7
25	1,780	.29	.088	40.8
26	2,980	.41	.120	45.7
27	570	.65	.170	38.1
28	408	.92	.106	86.0
29	1,270	.60	.178	92.0
30	1,300	.53	.123	32.1
32	5,700	.33	.165	44.8
33	800	.74	.168	56.4
34	4,900	.54	.157	41.0
35	2,060	.25	.318	26.5
36	11,200	.14	.097	45.4
37	11,200	.27	.191	65.4
38	38,600	.23	.153	27.5
39	7,440	.51	.150	47.4
40	970	.50	.144	60.9
41	1,320	.39	.095	54.8
42	13,700	.30	.098	84.7
43	60	.47	.195	83.2
44	1,000	.30	.148	58.5
45	263	.78	.142	54.3
46	1,500	.18	.186	79.3
47	1,770	.30	.237	20.7

Figs. 1, 2, and 3 show respectively the "scatter diagrams" for the correlation of n, a, and k with Log ρ. On each diagram there are also shown two lines; these are the regression lines; the solid line represents the equation of n, a, or k as a function of Log ρ, while the dashed line represents the equation of Log ρ as a function of either n, a, or k. If the correlation were perfect, the two lines would coincide, and the correlation coefficient,

Continued on page 118

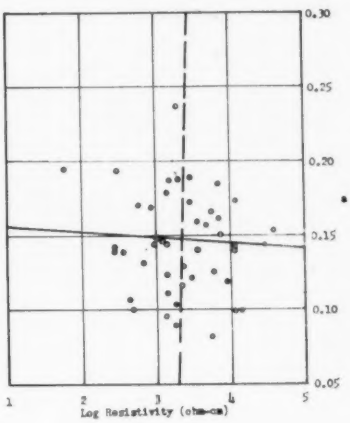


Fig. 2.

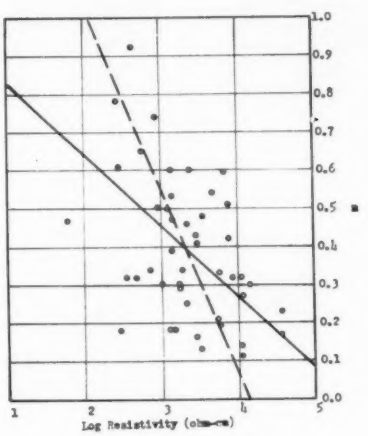


Fig. 1.

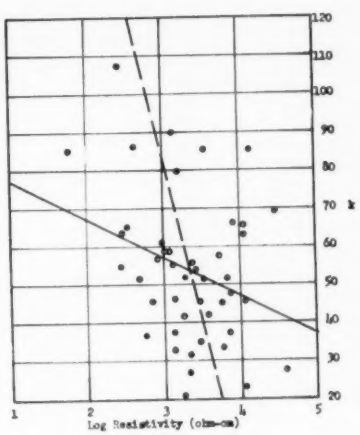
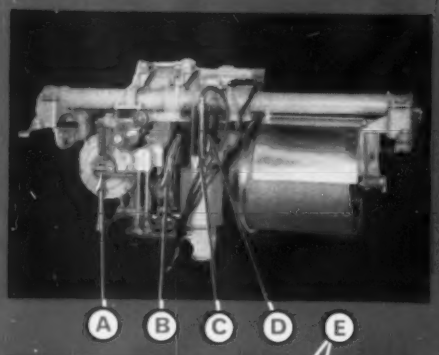
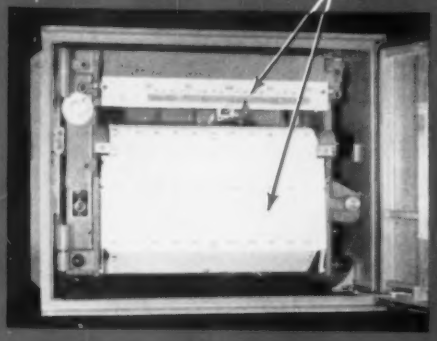


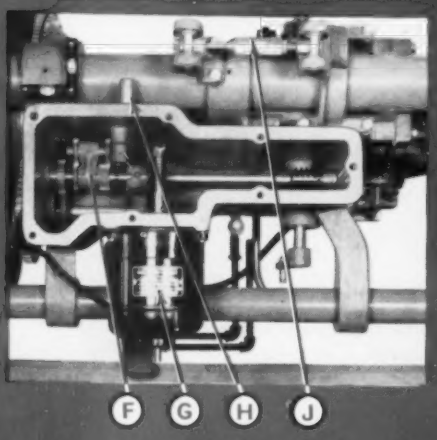
Fig. 3.

ARE YOU MISSING THE IN ACCURATE BTU

Completely Redesigned and Restyled...







GREATER ACCURACY

Capacities of main and reserve tanks have been increased to provide a more constant tank temperature. Both the gas meter (A) and air meter (B) have been designed to insure a constant, uniform flow of the air-gas mixture to the test burner (C). Improved thermometers (D) insure more precise temperature readings of the heat absorbing air, before and after passing the test burner. The length of the scale and chart (E) have been increased 10% and now offer more exact definition.

BETTER RELIABILITY

New high grade stainless steel test burner parts (C) resist deterioration from the products of combustion . . . maintain high thermal efficiency. New double action pump maintains accurate water level. High sensitivity and dependability in chart records with new electronic recorder (E). Tank unit mechanism now driven through enclosed oil bath gear transmission (F) by synchronous (constant speed) motor (G).

LESS MAINTENANCE

New glass fibre polyester water tank can't rust or corrode. Three position gear transmission system provides simple gear shift to "test-neutral-run" positions (H). Micrometer type gas meter adjustments (J) for simplified air to gas ratio proportioning. New center hinged cover permits access to parts from front, rear, or sides.

BIG PROFITS

COUNT? Use the New

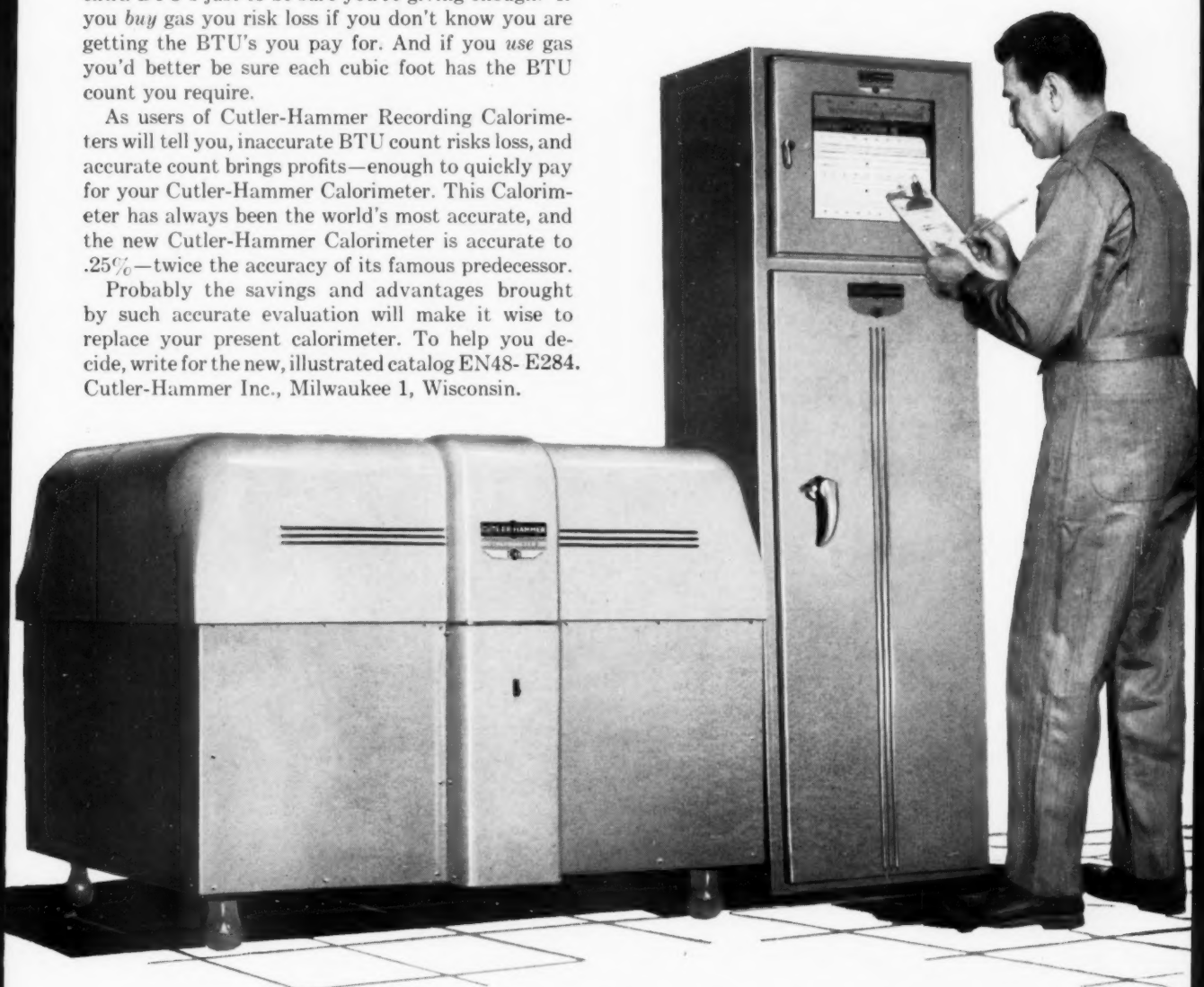
Cutler-Hammer Recording Calorimeter —Now TWICE the Accuracy!

Gas is like cash. Whether you buy, sell or use gas, if you count the BTU's *accurately* you stand to gain big extra profits and advantages. Here's why:

If you *sell* gas you short-change yourself if you give extra BTU's just to be sure you're giving enough. If you *buy* gas you risk loss if you don't know you are getting the BTU's you pay for. And if you *use* gas you'd better be sure each cubic foot has the BTU count you require.

As users of Cutler-Hammer Recording Calorimeters will tell you, inaccurate BTU count risks loss, and accurate count brings profits—enough to quickly pay for your Cutler-Hammer Calorimeter. This Calorimeter has always been the world's most accurate, and the new Cutler-Hammer Calorimeter is accurate to .25%—twice the accuracy of its famous predecessor.

Probably the savings and advantages brought by such accurate evaluation will make it wise to replace your present calorimeter. To help you decide, write for the new, illustrated catalog EN48- E284. Cutler-Hammer Inc., Milwaukee 1, Wisconsin.



CUTLER-HAMMER CONTROL

CUTLER-HAMMER

Cutler-Hammer Inc., Milwaukee, Wis. • *Division:* Airborne Instruments Laboratory. • *Subsidiary:* Cutler-Hammer International, C. A.

Associates: Canadian Cutler-Hammer, Ltd.; Cutler-Hammer Mexicana, S. A.; Intercontinental Electronics Corporation

International Petroleum Exposition

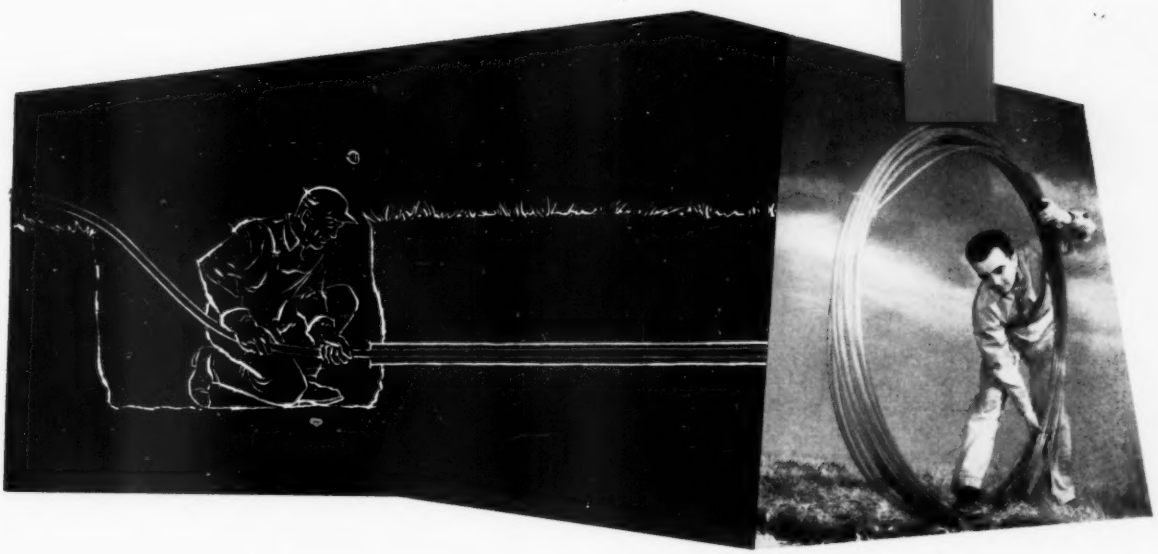
May 14-23 1959 • Tulsa, Oklahoma, U. S. A.

Night view of IPE with Tulsa Skyline

For Accommodations, write:
IPE Housing Bureau
Oil Capital Building, Tulsa, Oklahoma
For Space, write:
International Petroleum Exposition
P. O. Box 5205 Donaldson Station
Tulsa, Oklahoma
W. K. Warren, President
Wm. B. Way, General Manager

Dates of the IPE set in conjunction with World Petroleum Congress to be held in New York a week after the Tulsa Show

Tubing of Tenite Butyrate speeds replacements



You dig two holes instead of a ditch

Replacing corroded service lines is a much simpler operation when using plastic tubing of Tenite Butyrate. Trenching is eliminated—since holes are dug only at the main tap and service riser, with the new flexible tubing being run right through the old pipe.

Customers prefer this method because it saves their lawns and paved areas.

Field crews prefer this method because tubing made of Butyrate is light and easy to handle.

The entire length of tubing required for an average service of 70 feet weighs less than four pounds. Joints need no asphalt protection and simple adaptors make connections between tubing and metal pipe. What's more, tubing of Tenite Butyrate is not subject to the corrosive and electrolytic attack of the soil, assuring many years of trouble-free service.

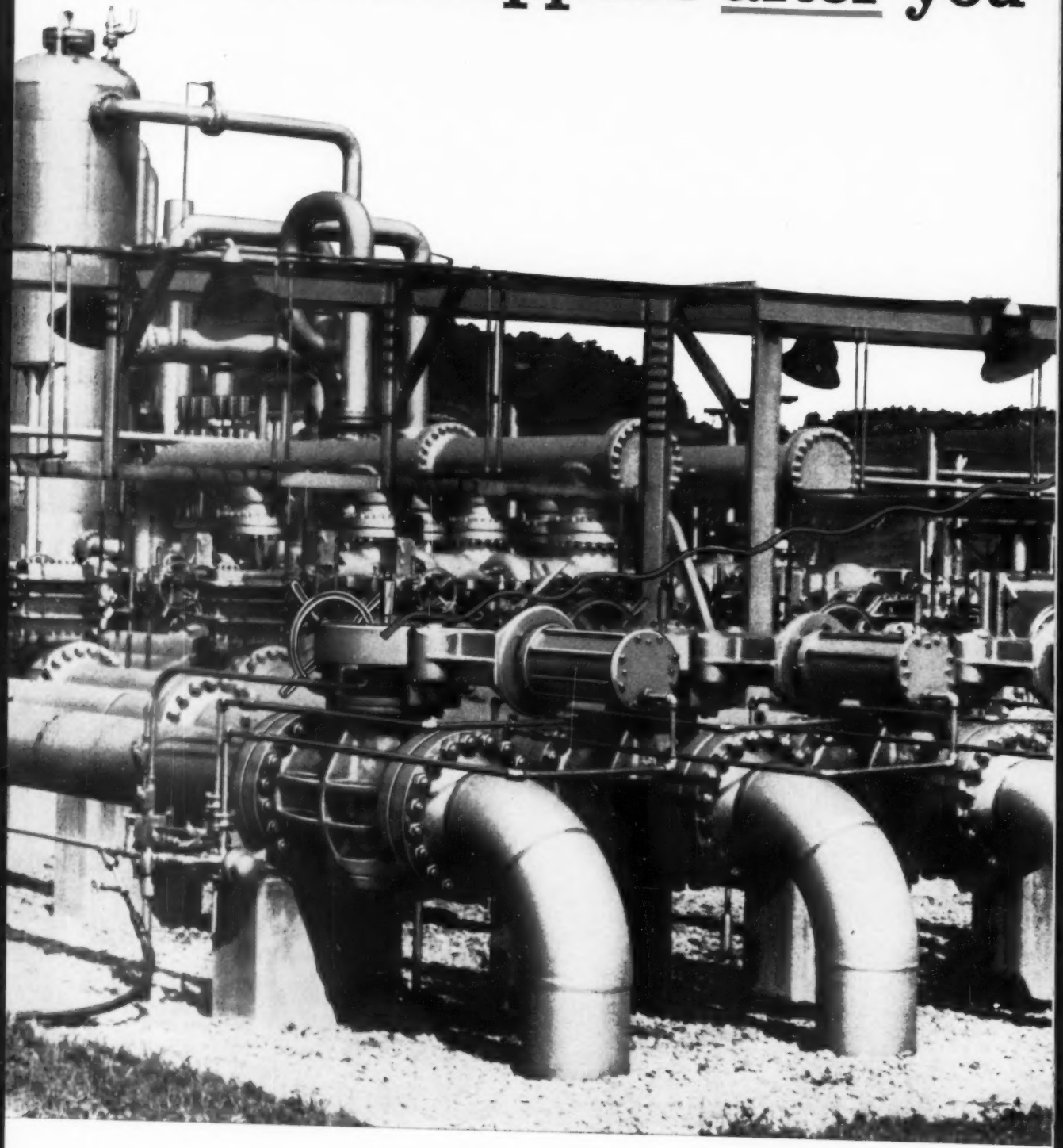
Since 1943, tubing of Tenite Butyrate has been a familiar friend to the gas industry—cutting installation time for service replacements and for new services as well. One company has already installed nearly 3,000,000 feet of tubing made of Tenite Butyrate. More recently, several progressive utilities have also installed *mains* of Tenite Butyrate.

Discover how this versatile Eastman plastic can help you in your operations. Send for literature describing the tubing, its fittings, and installation methods in natural gas service application. Ask, too, for the names of suppliers near you handling tubing of Tenite Butyrate. Write: EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

A 16mm. sound-color film, "Plastic Pipelines," is available upon request.

TENITE
BUTYRATE
an Eastman plastic

It's what happens after you



ROCKWELL-

push the button that counts!

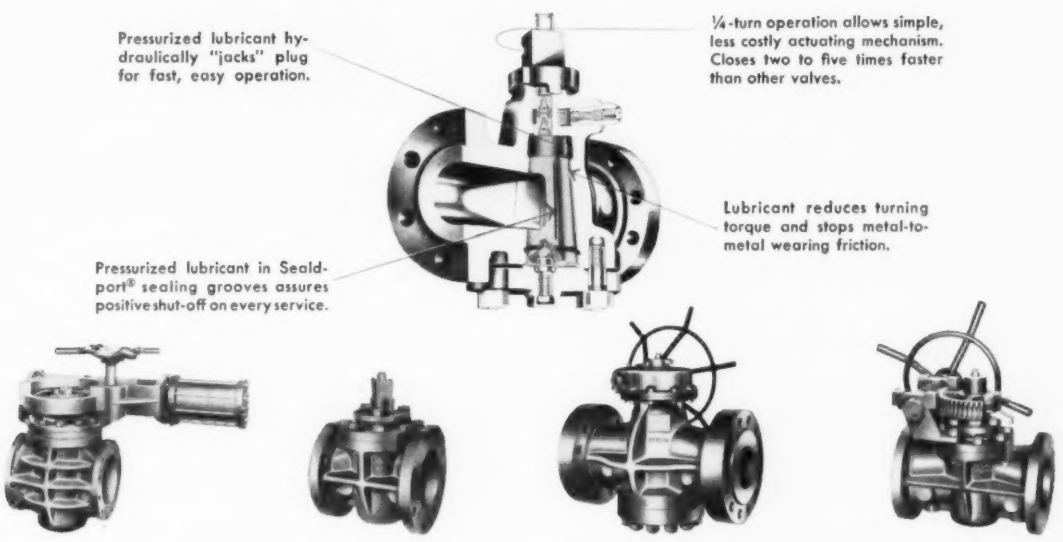
The new compressor station shown at the left is completely equipped for push button operation. But this kind of remote operation is only as reliable as the valves it activates. One stuck valve means inefficiency at least . . . catastrophe at most. That's why you always see Rockwell-Nordstrom lubricated plug valves where gas transmission and distribution men must have perfectly *dependable* control.

Rockwell-Nordstrom valves have proved ideal for automatic or remote operation because lubrication insures basic operating advantages that you can't expect in ordinary valves. See the drawing below for just a few of the reasons why these valves have been used in more gas industry installations than any other valve.

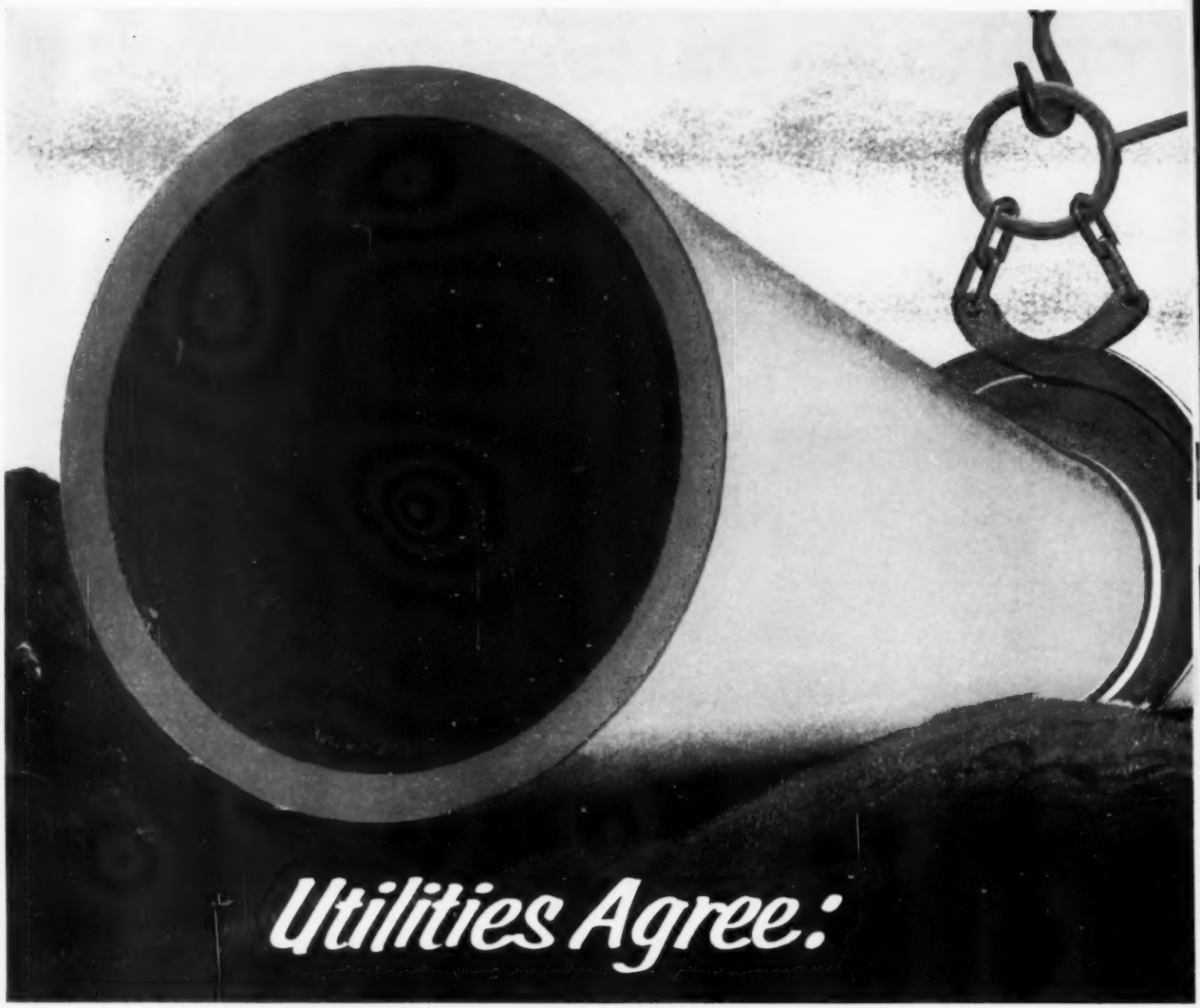
Rockwell-Nordstrom is the original and world's most complete line of lubricated plug valves. Available with electric motor, pneumatic and hydraulic actuations to meet any need. They cost no more to buy, often less, than ordinary valves and they save maintenance and down-time dollars everywhere they're used. For further details, write: Rockwell Manufacturing Company, Pittsburgh 8, Pa., Canadian Valve Licensee: Peacock Brothers Limited.

ROCKWELL-Nordstrom VALVES
another fine product by
ROCKWELL

LUBRICATION MAKES THE DIFFERENCE


Pressurized lubricant hydraulically "jacks" plug for fast, easy operation.
¼-turn operation allows simple, less costly actuating mechanism. Closes two to five times faster than other valves.
Lubricant reduces turning torque and stops metal-to-metal wearing friction.
Pressurized lubricant in Sealdport® sealing grooves assures positive shut-off on every service.

Nordstrom **VALVES**



Republic X-TRU-COAT Effectively Stops

Gas utilities are convinced. Republic X-TRU-COAT effectively stops corrosion in buried metal pipelines. More and more utilities are standardizing on X-TRU-COAT to protect valuable investments in gas services and mains.

The plastic jacket is high density polyethylene, continuously extruded over a special pressure-sensitive adhesive undercoat to form a moisture-proof, elastic bond with the pipe. One of the most inert plastic materials available, polyethylene is characterized by high chemical and electrical resistance, negligible water absorption, exceptional toughness, and flexibility.

The steel pipe and tubing is Republic Butt Weld or Electric Resistance Weld—uniformly ductile, round, and strong. This high-quality pipe and tubing assures accurate line-up of joints for better

Pipeline Corrosion

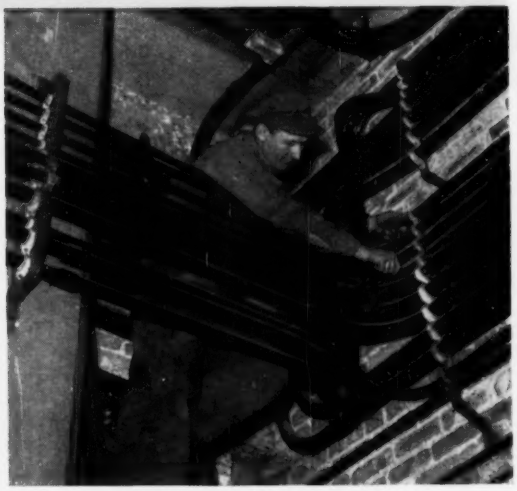
field welds . . . smooth bending in field or shop . . . complete dependability.

Because X-TRU-COAT's bright yellow color reflects heat, pipe remains at lower temperatures during summer storage, retaining its tough, abrasion-resistant properties. Joints are economically protected with plastic tapes or cold-applied joint compounds. X-TRU-COAT is available in a wide range of pipe and tubing diameters (through 5⅝"O.D.)and wall thicknesses. Contact your local Republic sales office for complete information.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

MEETING OTHER CORROSION PROBLEMS HEAD-ON!



REPUBLIC ELECTRUNITE "DEKORON®-COATED" E.M.T., in service nearly seven years at the Charmin Paper Products Company, Green Bay, Wisconsin, has outlasted standard conduit ten to one. A tough coating of polyethylene plastic is applied end-to-end on strong but lightweight E.M.T., making it impervious to corrosive atmosphere. Send coupon for additional data.

LOW-COST, CORROSION-RESISTANT SERVICE ENTRANCE LINES made up of Republic Semi-Rigid Kralastic Pipe and Tubing are gaining increasing acceptance for new and replacement use. SRK Pipe saves time and money in new connections through its low initial cost and ease of installation. Cutting is done with an ordinary handsaw. Lengths are joined with brush-applied solvent and socket-type fittings. On replacement jobs, SRK Tubing is threaded through existing line from tap to riser, eliminating costly trenching. Mail coupon for complete data.

REPUBLIC STEEL CORPORATION
DEPT. GA-7445
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Send more information on:
- ☐ X-TRU-COAT Plastic-Coated Steel Pipe and Tubing
- ☐ ELECTRUNITE "DEKORON-COATED" E.M.T.
- ☐ SRK Plastic Pipe

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

THE ANSWER TO CONNECTION PROBLEMS

The best and most economical method of making lateral or branch connections is to use Smith All Mechanical Joint Tapping Sleeves and Valves or Stopper Pieces. This method ELIMINATES GAS SHUT OFF and the permanent, leak-proof installation is achieved speedily by employing these simple procedures: 1. Block Sleeve Outlet Half under pipe, position side flange gaskets, bolt Sleeve halves together. 2. Position end joint gaskets; install follower rings, bolts and nuts. 3. Rotate Sleeve outlet flange to desired position, tighten follower ring nuts. 4. Tighten side flange gasket compression screws. 5. Attach Tapping Valve. The installation is complete and ready for tapping. 5. (Alternate) Stopper Pieces may be used in place of Valves when connections are made to low pressure mains and permanent shut off Valves are not needed; however, the use of Tapping Valves is recommended. The cost of the connection is reduced by quicker installation, elimination of skilled labor and costly jointing material. Bulletin will be sent on request.

51

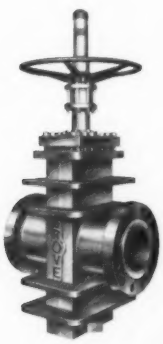
FIRE HYDRANTS · VALVES · SINCE 1896

THE A.P. SMITH MFG. CO.

EAST ORANGE, NEW JERSEY

IN CASE OF ANY EMERGENCY

HERE'S THE VALVE YOU KNOW WILL WORK



This is a rugged, dependable valve you can forget until you really need it. When you do—it'll work. There's no wedging to cause wear and jamming. The polished gate slides easily and quickly between smooth metal seats and rugged "O" rings. Exclusive Grove design lets gate and seats float free—eliminates distorting effects of pipe-line strain, internal pressure and temperature. Requires as many as 250 less turns to close than some competitive valves, too.

And, there's no lubricant to forget or to be washed away. Tough, flexible "O" rings are always there when you need them to give a bubble tight seal every time.

The next time you need valves, call your Grove man. He has the valves you can really depend on.

GROVE VALVE and REGULATOR COMPANY

65th & Hollis Street, OAKLAND 8, California

HOUSTON 27—3203 Mercer St. • LOS ANGELES 6—2559 W. Olympic Blvd.

ODESSA • TULSA • DENVER • CHICAGO • NEW YORK • DALLAS • PITTSBURGH

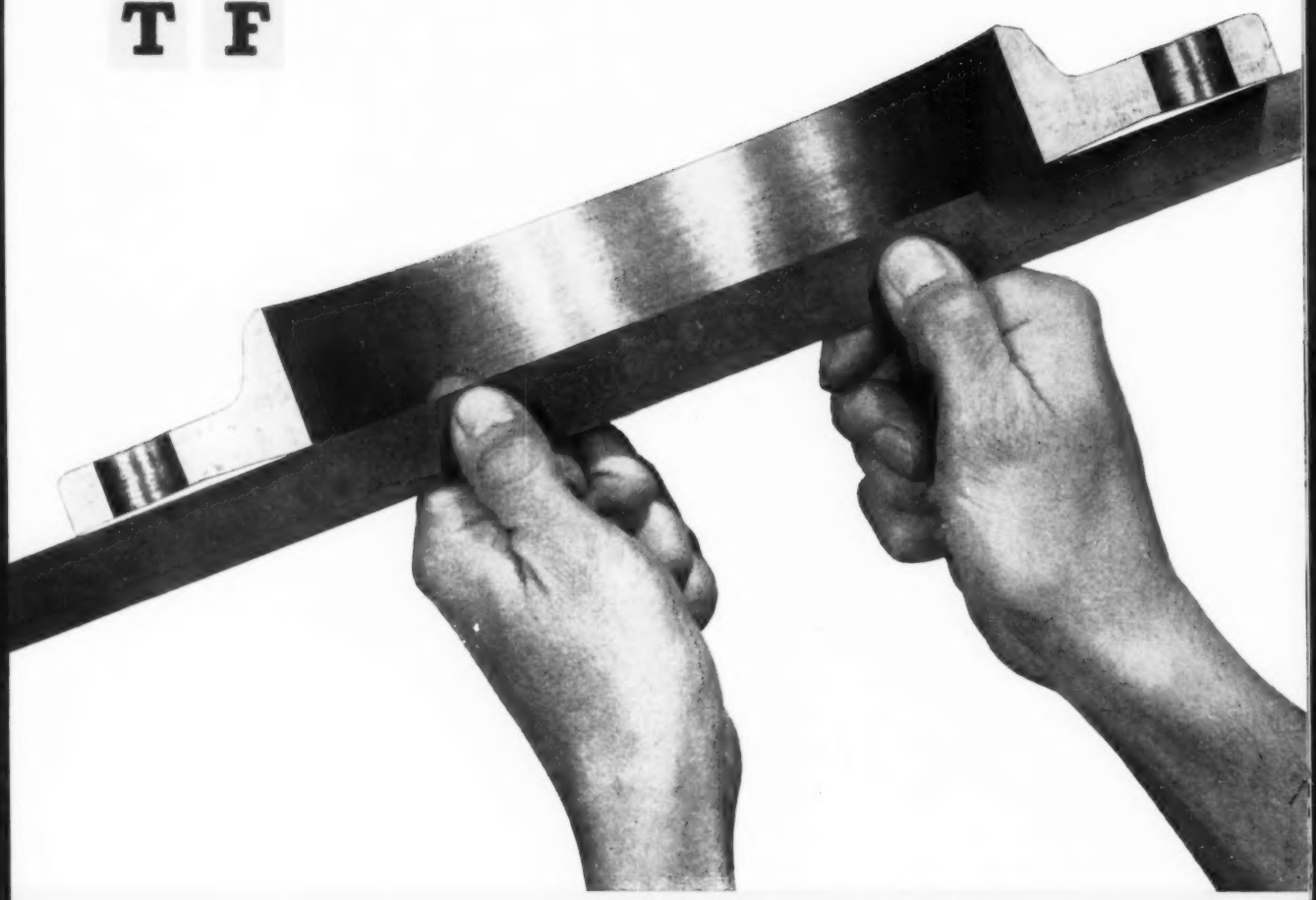
FARMINGTON, N. M. • LAFAYETTE, LA. • HARVEY, LA. • LONGVIEW, TEXAS

In Western Canada: GROVE VALVE LTD., EDMONTON

NOW — a really new

TAYLOR

T F



Other Taylor Forge products for Gas Transmission and Distribution Service

Taylor Forge is widely recognized as a preferred source for many products used by the Gas Industry in piping work such as: Welding Fittings (including Special Wall Thickness Gas Distribution Fittings); Forged Flanges; Electric Fusion Welded Pipe; Spiral-Weld Pipe; Headers for Compressor Engines, Valve Settings and other services; Hot Tap Split Tees; Anchor Flanges; Venturi Reducers and many other items. For full details and specifications, ask for our new Bulletin No. 593.

idea in flange design

FORGE

Traditionally Dependable

125 lb. Light Weight "Balanced Face" Flange*

For the first time in years the Gas Industry is offered an entirely new forged steel Butt Welding Flange which provides several distinct advantages:

1. **Greatly reduced stressing of mating flange permits use with perfect safety against Class 125 Cast Iron Flanged Fittings and Valves.**
2. **Far tighter sealing is accomplished.**
3. **Much lighter weight.**
4. **More economical..lower costs all along the line.**

The distinguishing feature of this new flange is found in the design of the face, which is machined in two planes, providing a double taper with a narrow section machined flat at the edge of the bore. It is easy to see that when bolt loading is applied, pressure is exerted first on the gasket area near the flange bore and then extends to the remaining area of the gasket. While highly intensified unit gasket pressure around the bore effects a positive seal, stresses in the mating flange of valve or fitting are so reduced that the possibility of breakage is virtually eliminated. Though rated at 125 psi, tests show no difficulty in holding pressures up to 700 psi with this new Balanced Face Flange.

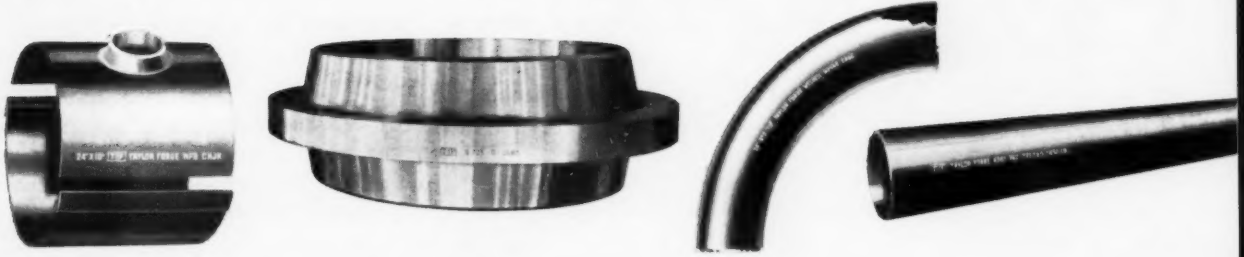
New Bulletin gives full details. Write for our new Bulletin No. 591 which illustrates and describes fully this remarkable new Balanced Face Flange.

Taylor Forge & Pipe Works

General Offices and Works: P. O. Box 485, Chicago 90, Illinois

Plants at: Carnegie, Pa., Somerville, N. J., Gary, Ind.,
Houston, Texas, Fontana, Calif., Hamilton, Ont., Canada
District Sales Offices:
New York, Boston, Philadelphia, Pittsburgh, Atlanta, Chicago, Houston, Tulsa,
Los Angeles, San Francisco, Seattle, Toronto, Calgary, Montreal, Caracas.

*Patent Pending



COOKING IN THE FIREPLACE
was romantic but hardly efficient. Heat was slow, uneven, uncontrollable . . . iron pots and pans, heavy. Feeding the family was work!

BASIC . . . but better than ever today

GAS "BURNERS WITH BRAINS" in today's kitchen . . . most recent achievement of the gas industry . . . "feel" and control heat in pots and pans . . . make cooking automatic . . . a pleasure!

Throughout the nation the cast iron gas mains of 55 major utilities are still serving after over a century of profitable operation. Cast iron pipe's quality is no accident. In our case, we assure it by controlling every production step. From mine to finished product, every length of pipe is subjected to exacting tests. This added care along our line contributes to smooth, trouble-free performance in yours.
You can depend on U. S. Pipe. Its performance is built-in.

SERVICE IS BUILT INTO CAST IRON

- Standardized mechanical joints are bottle-tight for usual gas distribution pressures . . . and for all types of gas.
- Centrifugally cast pipe is tough, strong and uniform.
- Joint design allows for deflection during and after installation.
- Service connections are easily made.
- Long life a matter of record.
- No shortages. Cast Iron pipe is immediately available.

U.S. cast iron PIPE
CAST IRON

U. S. PIPE AND FOUNDRY COMPANY
General Office: Birmingham 2, Alabama

A WHOLLY INTEGRATED PRODUCER
FROM MINES AND BLAST FURNACES TO FINISHED PIPE.

pipe protection for the future . . .

assured by pipewrapping craftsmen

An essential requirement for the best in coated-and-wrapped pipe is skilled, conscientious craftsmanship. It takes fully trained men who have devoted their lives to this work.

Hill-Hubbell has hundreds of these men. They are permanent employees, working under carefully controlled conditions in four modern plants. Their experience in cleaning, priming, coating-and-wrapping, inspecting and shipping pipe can mean extra protection for your pipelines, now . . . and in the future!

The best pipe protection is the most economical in the long run, so specify Hill-Hubbell — the name synonymous with quality in coated-and-wrapped pipe.

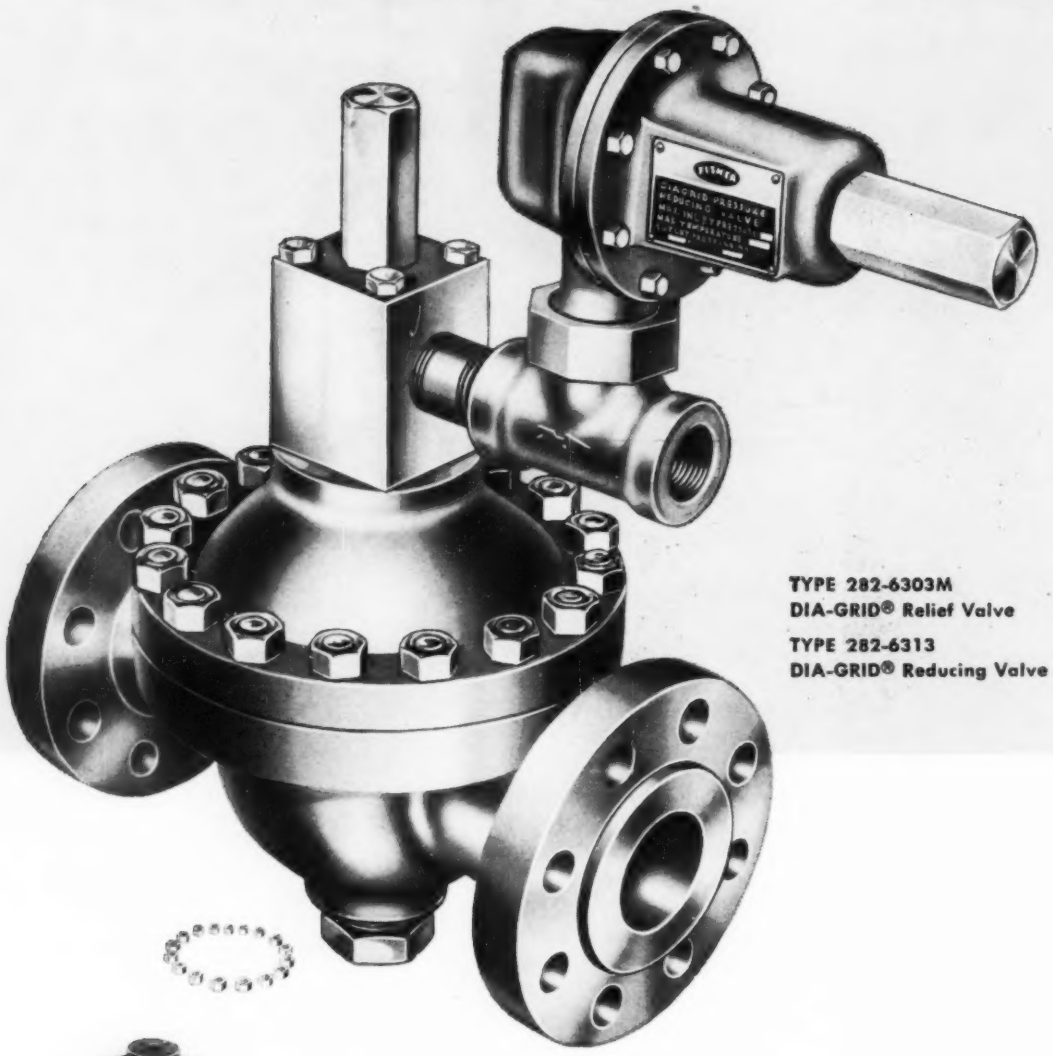
Specify Hill-Hubbell wrapped pipe on your next job . . .

HILL·HUBBELL

FACTORY APPLICATORS OF COATINGS AND WRAPPINGS

HILL-HUBBELL & CO. • 3091 MAYFIELD RD. • CLEVELAND 18, OHIO

DIA-GRID® Solves Many



TYPE 282-6303M
DIA-GRID® Relief Valve

TYPE 282-6313
DIA-GRID® Reducing Valve

SIMPLE and EASY TO MAINTAIN

Body does not have to be removed from line to inspect or replace internal parts.

IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD . . . CHANCES ARE IT'S CONTROLLED BY . . .

of the Gas Man's Problems

FISHER
TYPE 282
DIA-GRID®

For Pressure Relief or Reducing Service

- **LARGE CAPACITY**—will equal or exceed capacity on conventional single port body.
- **POSITIVE SHUT-OFF**—no leakage when closed against high or low pressure drops
- **ONLY ONE MOVING PART**—quickly and easily accessible for inspection and replacement

Controls High Pressure Drop with Dead-tight Shut-off from zero to full flow...quietly

Whenever there is a need for a large capacity positive shut-off valve that is simple, dependable and accurate, the Fisher Type 282 is the answer.

In fact, the 282 is more than a relief valve. With a choice of available pilots, the main valve becomes an efficient back pressure valve or a reducing valve, each having the basic advantages characteristic of the main body.

Regardless of its function, the main valve is basic simplicity, it has only one moving part—an expansible element which flexes to open and close the valve. Numerous bubble tests, made on all sizes, conclusively prove leak-tight design. No hunting or cycling occurs at any pressure setting. Its ability to relieve holds within ±1 psi.

Designed primarily for gas service, the Dia-Grid 282 can be used on liquid service wherever air or gas is available as a pilot operating medium.

BODY CONSTRUCTION

Sizes—2" and 4" flanged in iron or steel; 6" and 8" flanged steel
Grid—Stainless steel
Expansible Element—Two elements available—one for temperatures between 15 to 150° F., other for temperatures between −40° to 120° F.
The flexibility and simplicity of the Dia-Grid is enhanced with the wide range of pilots that are interchangeable on the same main valve body.

PILOT CONSTRUCTION

For Pressure Relief Service		For Pressure Reducing Service	
Pilot Type	**Relief Pressure Range**	**Pilot Type**	**Outlet Pressure Range***
6302	30 to 125 psi	6310L	5 to 50 psi
6303L	30 to 75 psi 75 to 150 psi	6310H	50 to 200 psi
6303M	70 to 150 psi 140 to 300 psi	6313	20 to 100 psi

**30 psi minimum pressure drop—300 psi maximum pressure drop.*

FULLY DESCRIPTIVE BULLETIN ON REQUEST

FISHER® Controls
SINCE 1880

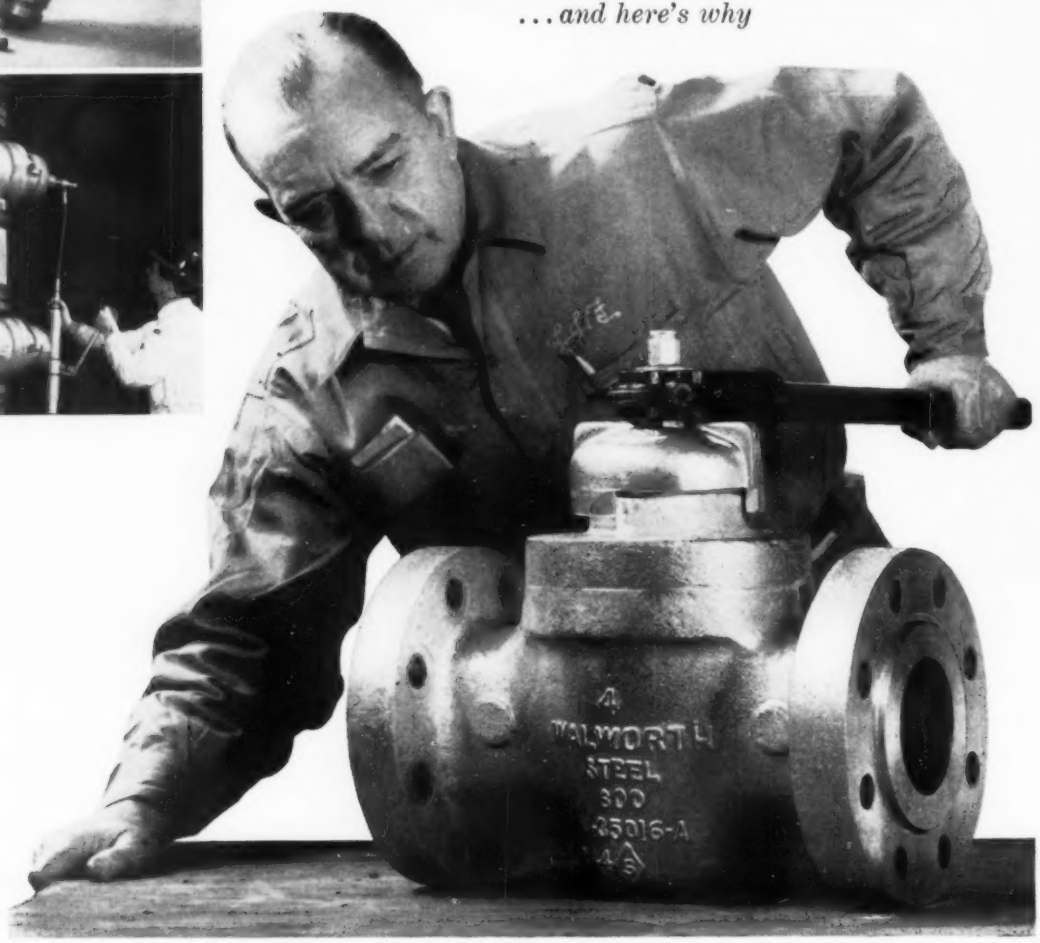
FISHER GOVERNOR COMPANY
Marshalltown, Iowa / Woodstock, Ontario / London, England
CONTINENTAL EQUIPMENT CO. DIVISION, Coraopolis, Pennsylvania

the **WALWORTH CUSTOMER**

wants a quick operating, sure, tight valve. He chooses a

WALWORTH LUBRICATED PLUG VALVE

. . . and here's why



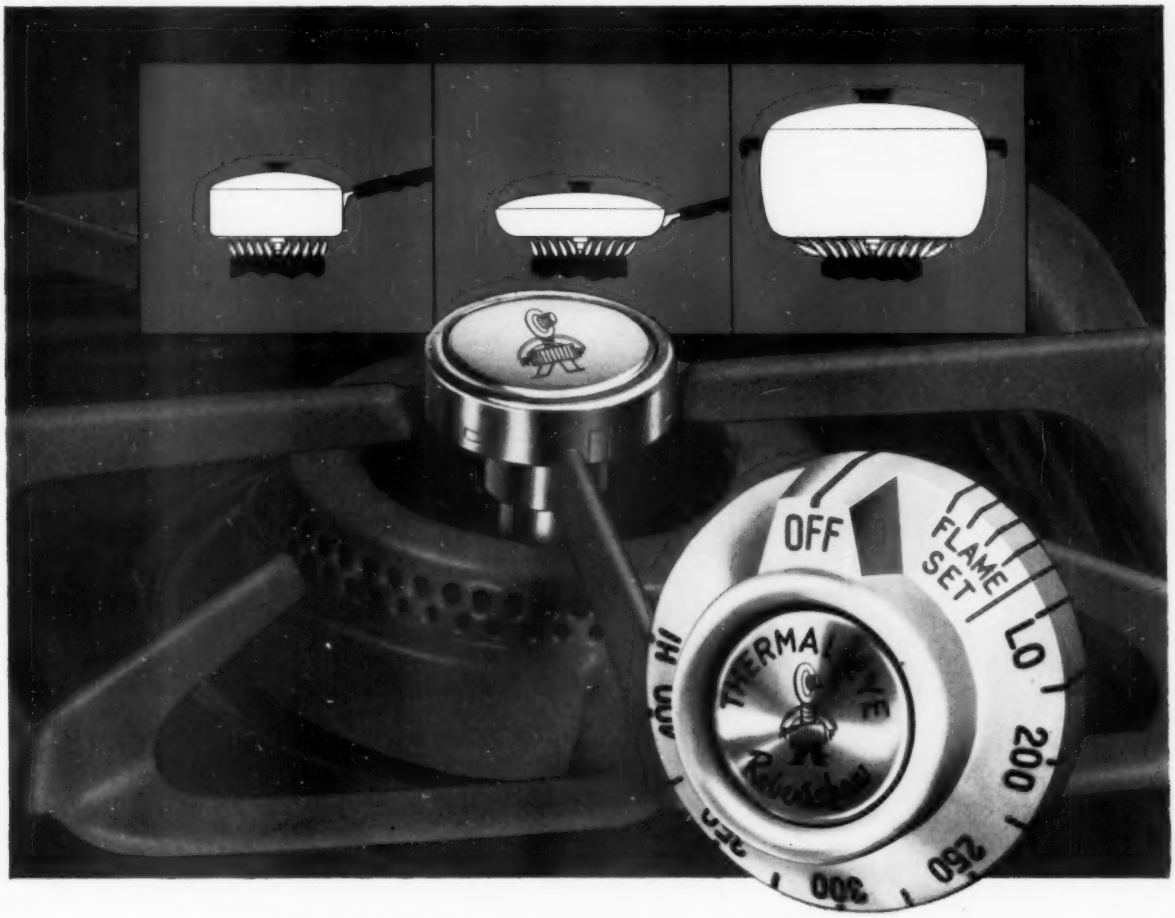
When the Walworth Customer has to decide on a valve that will close fast and easily, he wants to know HOW fast . . . HOW easily. Tight closure? Of course. But can the valve be serviced under pressure? Yes. Still, he tries one himself.

In the Walworth Lubricated Plug Valve he finds 100% tight closure because it is lubricant-sealed against leakage. He finds it opens or closes with a quarter turn. Then, and only then, he's ready to buy. If that's the way you like to buy valves, we want you, too, for a Walworth Customer. For details on all types and ratings of Walworth Lubricated Plug Valves, ask your Walworth Distributor.

Or write **WALWORTH** *750 Third Avenue, New York 17, N. Y.*

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

WALWORTH SUBSIDIARIES: ALLOY STEEL PRODUCTS CO. • CONOFLOW CORPORATION • GROVE VALVE AND REGULATOR CO. M&H VALVE & FITTINGS CO. • SOUTHWEST FABRICATING & WELDING CO., INC. • WALWORTH COMPANY OF CANADA, LTD.



New FLAME SET* "burner with a brain" gives you a big extra!

On 1959 gas ranges, look for this new Robertshaw FLAME SET "burner with a brain." It makes top of the range cooking truly automatic. It's a big, extra sales feature.

With the *old* "burner with a brain," the flame starts at full height and continues at full height until the pan heats to the preset temperature. Result: scorching in small and in non-aluminum utensils.

The FLAME SET feature of the new "burner with a brain" corrects that fault. Now, the homemaker selects the desired temperature *and the right size flame* to suit the pan size . . . Small pan—small flame. BIG pan—BIG flame.

In non-aluminum utensils, perfect frying and food warming calls for a *moderate* flame . . . a high flame causes hot spots. Now, with the FLAME SET "burner with a brain," the homemaker can adjust the flame to extend about halfway between the center and edge of the pan bottom. *The heat spreads evenly* . . . and there's no scorching!

The flexibility of gas is utilized to its fullest extent by this new FLAME SET "burner with a brain."

For new bulletin, write today to Robertshaw Thermostat Division, Robertshaw-Fulton Controls Company, Youngwood, Pennsylvania.

*TRADE MARK

Robertshaw

MR. CONTROLS

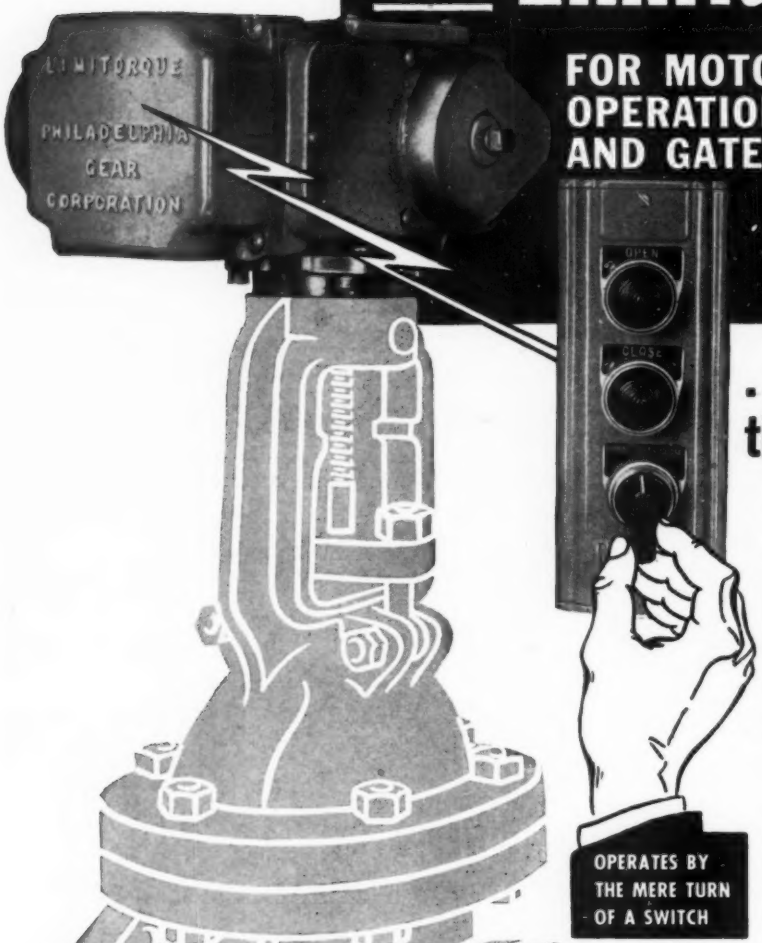
The inventor of the "burner with a brain" . . . modernizes it with the FLAME SET feature

New LimiTorque

TYPE P-2

FOR MOTORIZED AUTOMATIC OPERATION OF SMALL GLOBE AND GATE VALVES

. . . Economically and Efficiently



. . . truly a dependable time and money saver

Here is a new, compact, economical and dependable LimiTorque Motorized Operator for use on small (normally hand-operated) Globe and Gate Valves — either new or already in service. Your existing hand-operated valves can now be easily motorized by the removal of the hand-wheel, and mounting the P-2 Unit on the same bonnet . . . the Unit output drive sleeve will then drive the hand-wheel unit, which arrangement is suitable for both rising and non-rising stem valves.

The P-2 LimiTorque Operator has a standard out-put speed of 22.5 or 45 rpm, which covers the average and recommended operating speed for most Globe and Gate Valves.

Remember, this new P-2 LimiTorque is built by the largest manufacturer of Motor Operators for Valves in the World . . . backed by nearly 30 years experience.

BE CONVINCED how the P-2 can save you time, labor and money in the operation of small valves — just write for Bulletin No. 21-58, which not only illustrates and explains its operation, but shows how easily it can be installed on existing or new valves.

Contact your Valve Manufacturer, or your nearest LimiTorque Sales Engineering Office.

Use your Business Letterhead when sending for special Bulletin 21-58

EASILY INSTALLED ON NEW OR EXISTING VALVES

"Motorize to Economize"

THERE IS NO SUBSTITUTE FOR —

LimiTorque®

PHILADELPHIA GEAR CORPORATION

ERIE AVE. & G STREET, PHILADELPHIA 34, PENNA.

Offices in all Principal Cities

INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID AGITATORS • FLEXIBLE COUPLINGS

Limitorque Corporation • Philadelphia

COMPARE

More Capacity At Less Cost With R-C Rotary Gas Meters

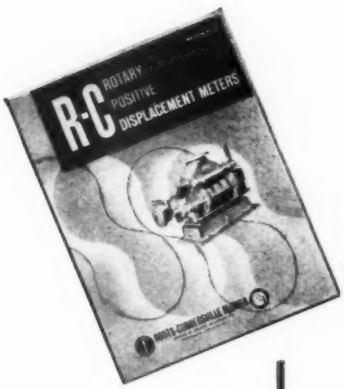
R-C rotary gas meters are available in a wide range of sizes delivering "cash-register" accuracy in capacities from 2,000 to 1,000,000 cfh at pressures to 600 psig and are ideally suited for commercial, institutional, industrial, interplant accounting and pipeline metering.

Comparative Analysis	SPACE OCCUPIED	TOTAL CAPACITY	METER COST	INSTALLING COST	TOTAL COST
FOUR DIAPHRAGM METERS					
ONE R-C METER					

As the comparative chart indicates, cost is reduced and capacity is increased with R-C rotary positive displacement meters. The total capacity of one R-C meter exceeds that of two or more diaphragm meters. Both initial cost and installing costs are substantially lower. Their small space requirements permit installation in otherwise unusable space. And operating costs are held to a minimum, since maintenance is confined almost entirely to lubrication of gears and bearings and to an occasional check of the operating differential.

Roots-Connersville rotary positive displacement gas meters provide a 15:1 operating range – metering unmatched by any other design. Precision-machined measuring chambers insure unalterable accuracy unaffected by variations in specific gravity, rate of flow, pulsations or impurities. And there are no valves, diaphragms or other small parts to wear and cause inaccuracies.

Pressure drop is minimized, since R-C's straight-through design eliminates winding passages and restricting ports. Even at low flows, these meters retain "cash-register" accuracy. These advantages are the result of R-C's specialized experience of more than 100 years in the design and application of air and gas handling equipment.

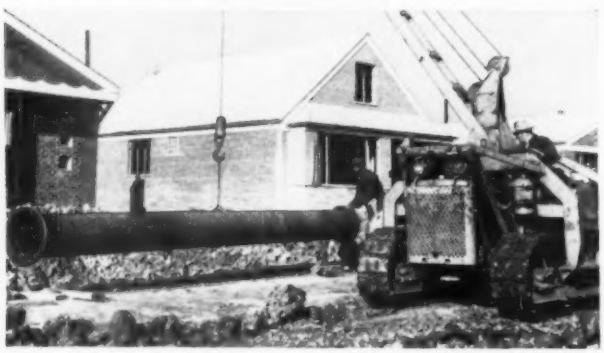


For additional data, please refer to pages 565-568 in **Chemical Engineering Catalog,** *our section in* **Mechanical Catalog** *or write for* **Bulletin M-258**

ROOTS-CONNERSVILLE BLOWER
DIVISION OF DRESSER INDUSTRIES, INC.
359 Oregon Ave., Connersville, Indiana. In Canada—629 Adelaide St., W., Toronto

A Century of Dependability

MODERN



Since Before 1860

Lincoln was still a practicing lawyer when 59 gas utilities throughout America and Canada first installed their cast iron gas mains. Today, over a century later, these mains operate with the same efficient service—*for all 59 companies!* Under almost all soil conditions, cast iron mains laid 50, 70, 100 years ago still remain in good operating condition.

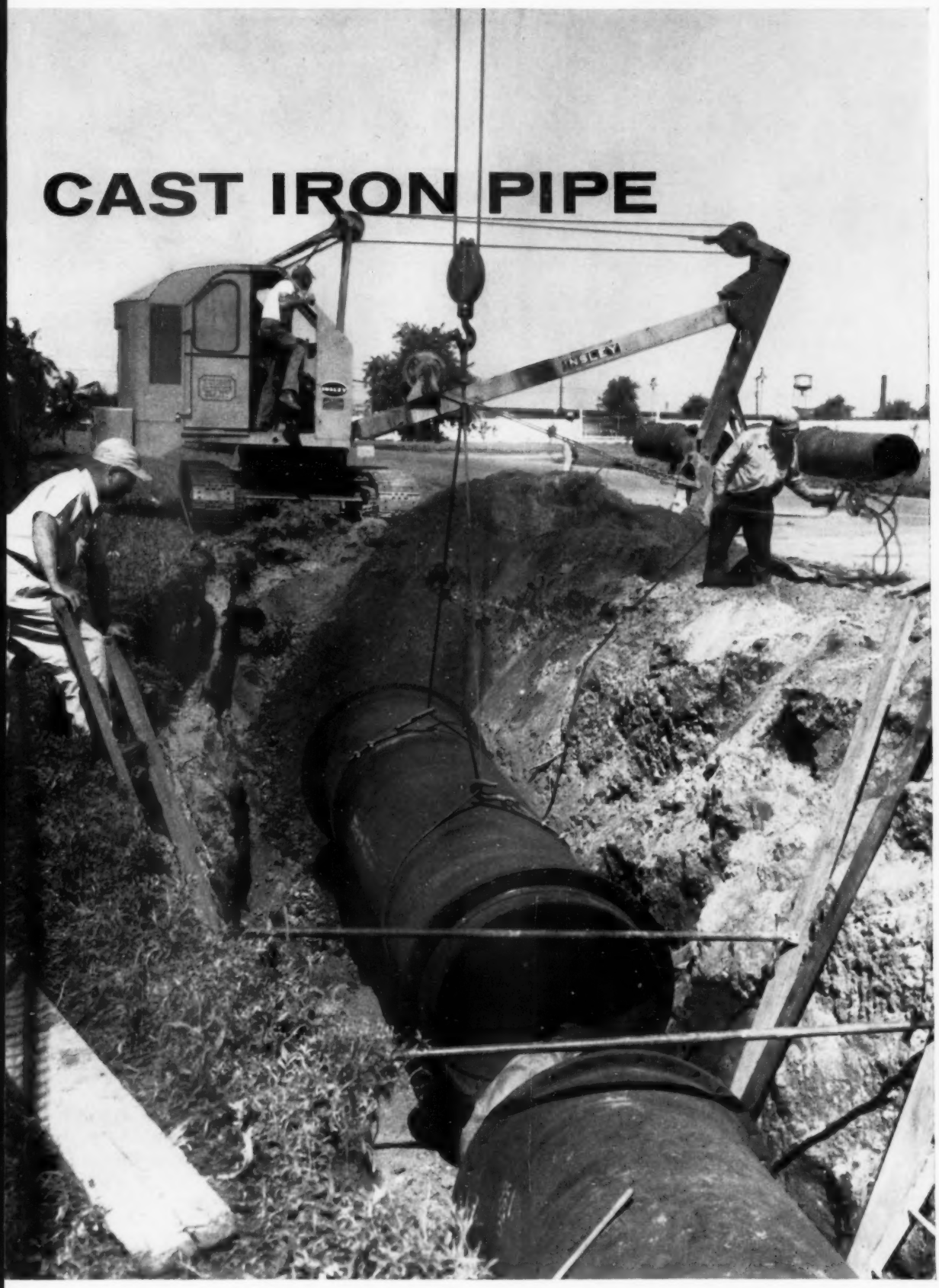
Modern and Versatile

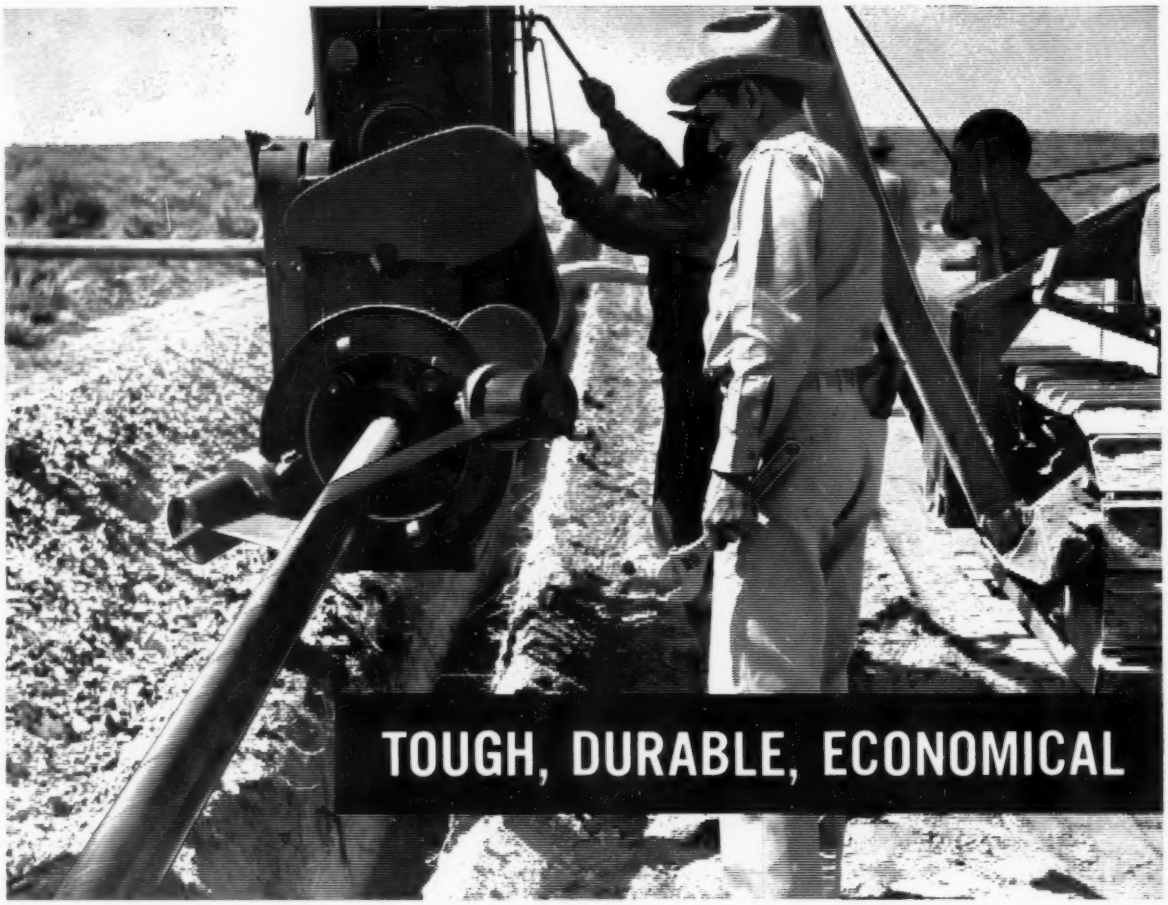
Today's cast iron pipe is centrifugally cast, giving it a tensile strength 50% greater than even those rugged mains of yesteryear. Beam strength and load resistance have been increased. Modern bottle-tight mechanical joints withstand vibrations, washouts and heavy top loads. Laying and backfilling of cast iron pipe go quickly—no bulky jointing equipment is required for the job. The short lengths of cast iron pipe make for easy handling in congested underground areas.

...All good reasons for you to choose

CAST IRON PIPE

Write for complete information to Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 3440 Prudential Plaza, Chicago 1, Ill.


CAST IRON PIPE



Safe-T-Clad®

POLYETHYLENE TAPE

by

SEAMLESS

NOW AVAILABLE THROUGH THESE LEADING DISTRIBUTORS

ROYSTON LABORATORIES, INC.
Blawnox, Pittsburgh, Pennsylvania
Atlanta, Georgia • Chicago, Illinois
Philadelphia, Pennsylvania

NEE & McNULTY, INC.
Denver, Colorado • Houston, Texas
Tulsa, Oklahoma

RUST-PROOFING, INC.
Phoenix, Arizona

THE FROST ENGINEERING SERVICE COMPANY
Huntington Park (Los Angeles), California

The simple, modern way of protecting pipelines. Polyethylene tape by Seamless gives positive protection, whether it be accessory use or mainline construction.

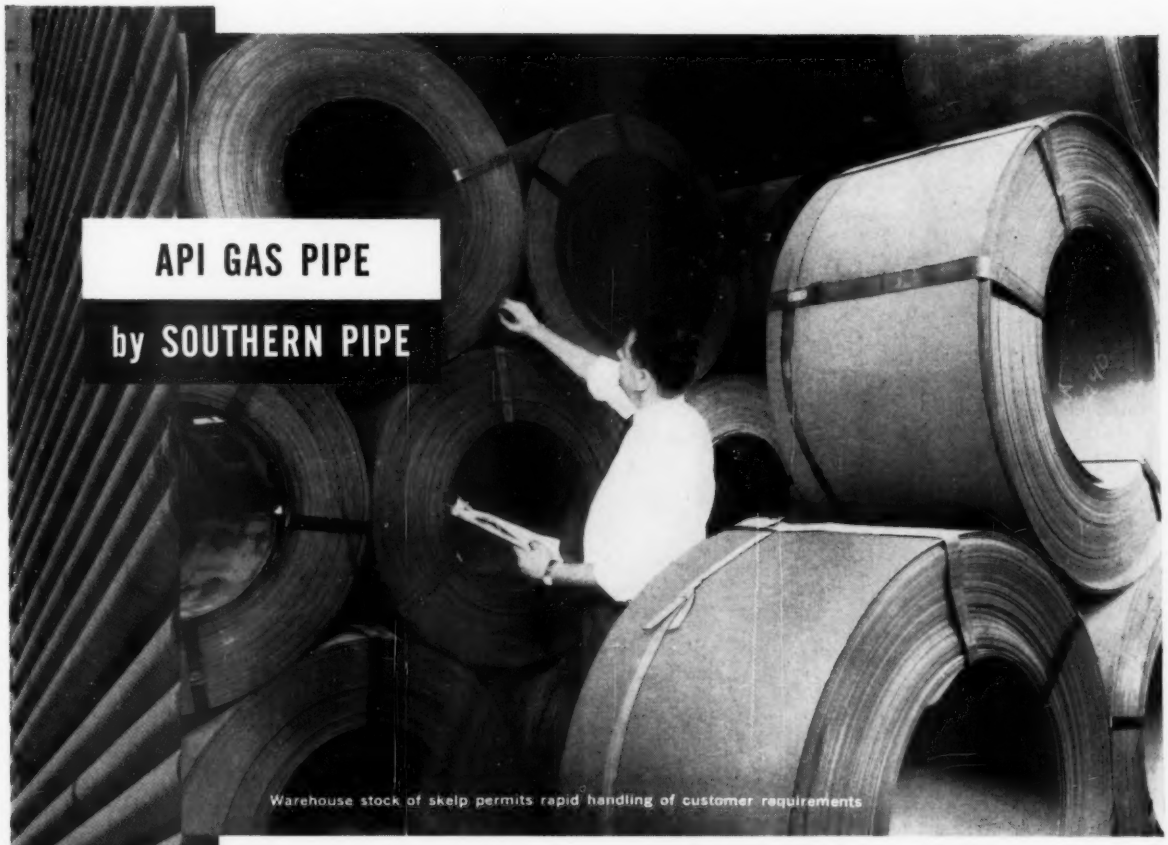
Safe-T-Clad is an inert unplasticized polyethylene tape coating. Positive corrosion control with little or no field preparation.

Simplified application techniques
Substantial labor savings
Less equipment
No hazardous heat and fumes

Available in small rolls for accessory use, and large "Traveliner" for transmission lines.

Write for field specifications and particulars

SAFE-T-CLAD DIVISION
THE SEAMLESS RUBBER COMPANY
NEW HAVEN 3, CONNECTICUT



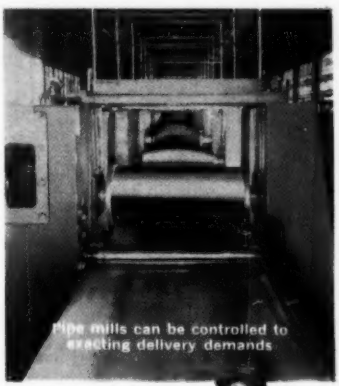
Warehouse stock of skelp permits rapid handling of customer requirements

FLEXIBLE MANUFACTURING SCHEDULES SPEED JOB COMPLETIONS

Southern Pipe's completely integrated pipe production facility eliminates the long waiting periods commonly encountered at most pipe mills. Yet, large custom pipeline jobs are handled as capably as "out-of-stock" deliveries. A large stock of skelp (steel coils) assures customers of a ready stock to meet wall thickness requirements. And, Southern's high frequency welding process handles API diameters ranging from 3" to 14".

Southern Pipe offers gas pipe users: (1) Fully normalized weld; (2) Only minor metallurgical change in material adjacent to weld; (3) Thin-wall high strength at less cost per foot.

Write now for literature describing the most fully developed installation of protective coating, lining, and pipe producing equipment in the west.


Pipe mills can be controlled to exacting delivery demands

Quality is constantly controlled, checked, tested

Southern Pipe

DIVISION OF U. S. INDUSTRIES, INC.

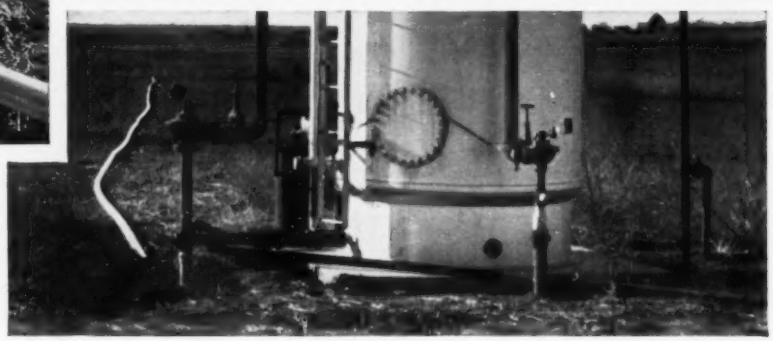
P. O. Box C • Azusa, Calif. • CUmberland 3-7111 • EDgewood 7-1221

News about

B.F.Goodrich Chemical *raw materials*

Geon pipe running to tank battery and water separator in distance is concealed by freshly covered-over trench. Geon pipe is being used for oil and gas lead lines up to 250 psi working pressures.

Three-inch Geon pipe leads through fitting made of Geon into 4-inch salt water disposal pipe, also made of Geon.



Three-inch Geon pipe carries salt water from a crude oil de-watering tower to a disposal well 1000 feet away. It will be buried after a second line feeding into the disposal line is installed.

Hundreds of wells per year show how to . . .

save with pipe of Geon

Pipe made from Geon rigid vinyl saves time and work—it is so lightweight and easy to install. And maintenance costs are considerably lower.

Pipe of Geon is immune to galvanic corrosion, is highly resistant both to salt water and sour crude oil. It stays smooth inside and out. And it provides high tensile or impact strength, standing up under pressure.

Engineers are taking advantage of the unique properties of Geon pipe for a wide variety of applications. For information on how you can cut costs by using pipe of Geon, write Dept. AP-1, B. F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON polyvinyl materials • HYCAR rubber and latex
GOOD-RITE chemicals and plasticizers • HARMON colors

stop-off high pressure 4", 6" and 8" lines *Safely*

NEW MUELLER®

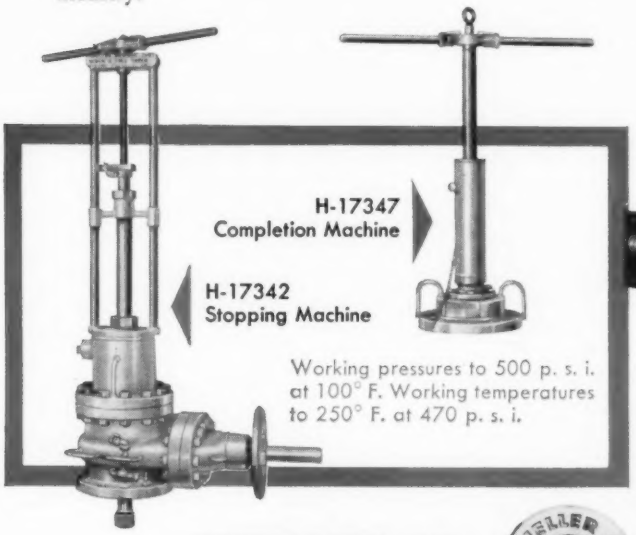
Line Stopper Unit

No. 3SW - 500

Now—Mueller Co. has developed a line stopper unit to give quick, effective, economical stop-offs of 4", 6" and 8" lines *under pressures up to 500 p. s. i.*

Unit No. 3SW-500 includes the necessary machines and equipment to make two stop-offs at once. Convenient, built-in by-pass connection makes it easy to set up a temporary by-pass line, preventing interruption of service to other customers on the line. Relocations, tie-ins and repairs can then be made in complete safety.

These design features are typical of the attention to detail in research, design and engineering that becomes a part of every Mueller product produced for the gas industry.



Working pressures to 500 p. s. i. at 100° F. Working temperatures to 250° F. at 470 p. s. i.

Making a stop-off on a 6" line with a Mueller H-17342 Stopping Machine.

NO-BLO®

MUELLER CO. **DECATUR, ILL.**

Factories at: Decatur, Chattanooga, Los Angeles; In Canada: Mueller, Limited, Sarnia, Ontario

Designed for utilities, the Barber-Greene Runabout digs only the size trench required—no excess material to backfill. Also pulverizes material, simplifying backfilling. Write for complete information.

Helping to halt the rising cost of gas distribution

Distribution costs of gas utilities continue to rise. This is partly due to their specialized requirements and the need for specialized tools. For service ditching, there is a special machine designed specifically for the peculiar needs of utilities—the Barber-Greene Model 705-B Runabout.

Runabout advantages

- It travels to the job under its own power. No trailer required.
- Digs straight down, jumping walks and other obstructions . . . leaves no ramps to be dug out by hand.
- Exclusive Hydra-Crowd transmission gives an infinite selection of digging speeds to 16 feet per minute. No stopping to shift speeds. Assures maximum speed in any soil.
- New curved digging teeth give three times longer life.
- Rugged construction allows it to dig where other machines fail, and cuts maintenance costs to minimum.
- Easily operated from cab or ground. Finger-tip controls.

The Runabout is just one of Barber-Greene's line of wheel, ladder, and vertical boom ditchers.

No trailer needed with the Barber-Greene Runabout Ditcher. It speeds from job to job under its own power. Ready to dig on arrival.

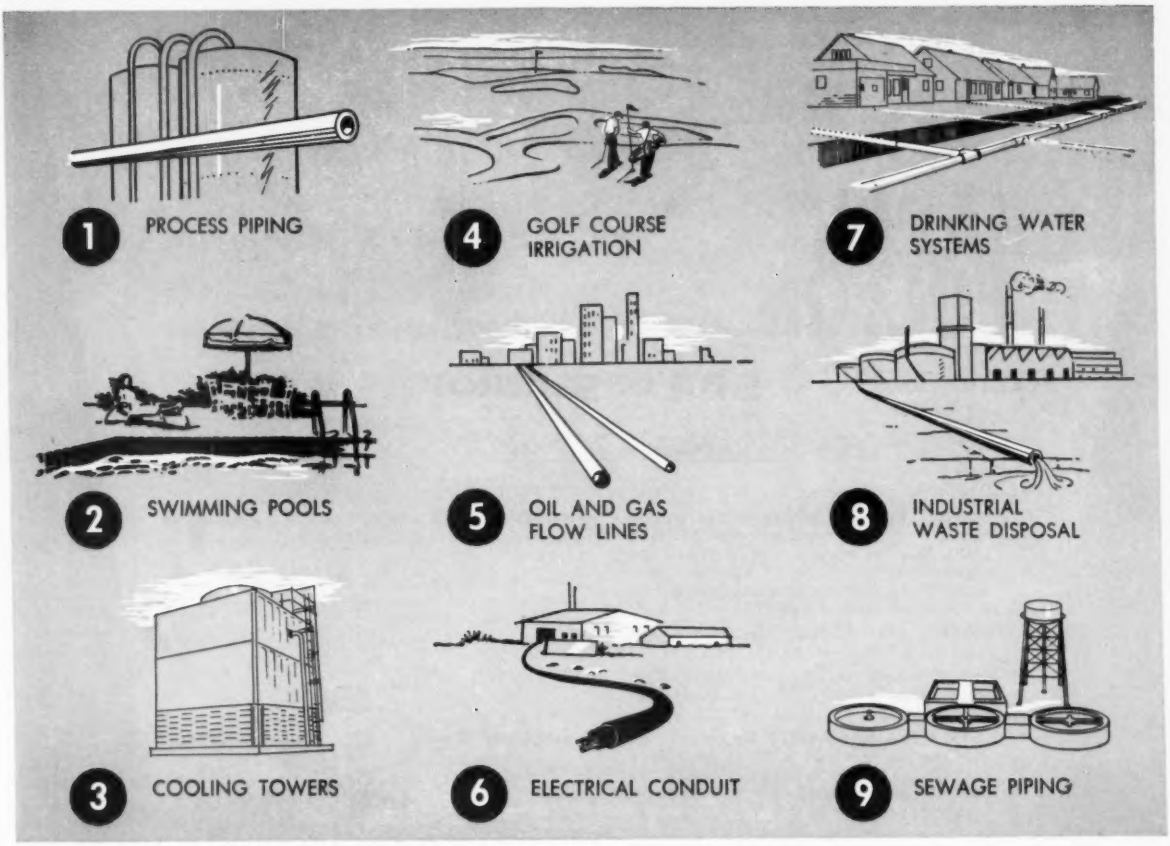
58-22-D

Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

PLASTIC PIPE *Check List*



Specify YARDLEY for engineered applications

Yardley, one of the largest and oldest producers of plastic pipe, offers both flexible and semi-rigid pipe especially engineered for plumbing and air conditioning applications.

This advanced line of pipe is available in a variety of materials including normal and high-density polyethylene, Kralastic,® rigid PVC, styrene copolymer and other special formulations. Sizes from ½ inch through 10 inches in diameter with pressure ratings up to 200 psi. at 74°F . . . a complete line of precision fittings for every requirement.

Yardley pipe is distributed nationally, supplied from 11 completely stocked warehouses, assuring immediate delivery to any point in the country. For complete technical data and specifications, mail the coupon today.

YARDLEY

YARDLEY PLASTICS CO.
142 Parsons Ave., Columbus 15, Ohio

YARDLEY PLASTICS CO.
142 Parsons Ave., Columbus 15, Ohio

Send me a copy of Catalog 2000 which contains specifications and data on Yardley Pipe

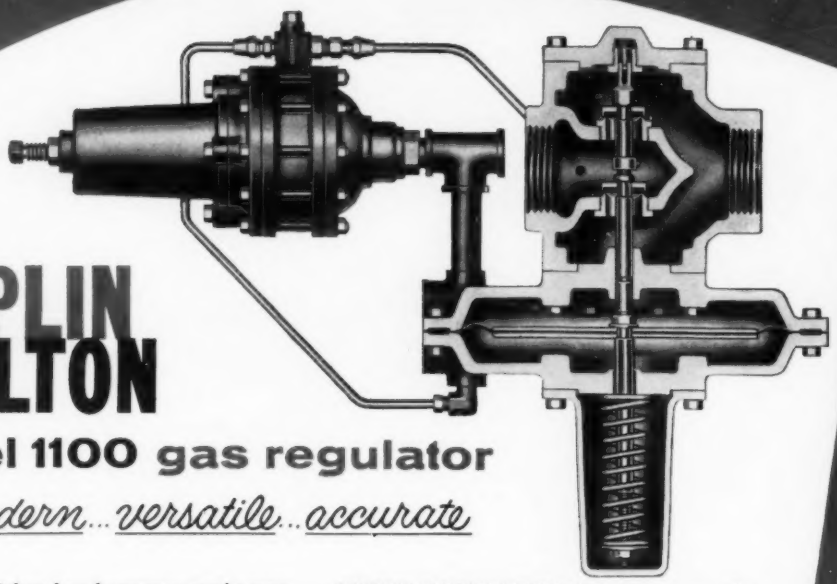
NAME_____

FIRM_____

TITLE_____

ADDRESS_____

CITY_____ STATE_____



CHAPLIN FULTON

model 1100 gas regulator

modern... versatile.. accurate

You can't buy, beg, borrow or steal a more versatile pressure regulator than MODEL 1100. Nor has traditional Chaplin-Fulton ruggedness, simplicity or accuracy been forgotten in this new modern design. Size —2" only, screwed, flanged 125 or 250 ASA.

WIDER APPLICATION Inlet Max.—400 psi. Outlet Range—1" to 150 psi.

GREATER CAPACITY 24,000 cfh at 10 psi to ounces; 114,000 at 100 psi. Body contoured for flow.

EASIER MAINTENANCE Regulator or pilot can be serviced without disturbing the other. Quickly accessible orifices in both, easily renewable.

SIMPLER INSTALLATION Only one connection required. No complicated pins or toggles to adjust.

You can standardize on MODEL 1100 for a wider range of your industrial, commercial or distribution installations.

ACCURATE CF MFG CO DEPENDABLE

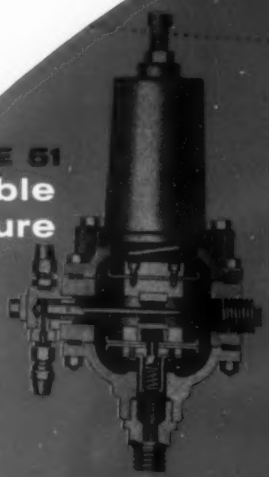
WSW 6838

Write for bulletin 1100

Chaplin-Fulton

MANUFACTURING COMPANY

Pittsburgh 25, Pennsylvania



TYPE 61 variable pressure pilot

The heart of the MODEL 1100 assembly, insuring precisely accurate control over the complete flow range.

- Unitized construction—valve lever and orifice as a unit are removed from the outside, without disturbing balance of assembly. The likely trouble spot—the orifice—is placed outside where you can get at it quickly—no internal tubes to clog.
- Twin diaphragms remove as a unit.
- Internal relief unit—guards against overpressure.
- Spring unit—remove three screws to change springs.
- Built for service.
- Used for accuracy.

NEW! AMERICAN DUCTILE IRON PIPE FOR GAS SERVICE

THE SUPER-STRENGTH, CORROSION-RESISTANT PIPE THAT BENDS UNDER STRESS!

Now! The proven corrosion resistance of standard gray cast iron is also characteristic of a new metal, AMERICAN DUCTILE Iron, which possesses physical properties comparable to those of steel.

In AMERICAN DUCTILE Iron pipe, you will find great strength and resistance to impact, high pressure capacity and ample wall thickness. AMERICAN DUCTILE Iron pipe requires no special wrappings, coatings or other protection against corrosion. You get extra safety factors, longer service life, lower maintenance costs.

Call your American Cast Iron Pipe Company representative for full facts about AMERICAN DUCTILE Iron pipe — the ideal pipe for gas service.

Corrosion Resistance—The inherent corrosion resistance of cast iron insures maximum life without the expense and inconvenience of special wrappings or other protective devices.

High Strength—Withstands extreme beam and crushing loads.

High Resistance to Impact—Absorbs shock and stress . . . avoids transportation and rough handling damage.

High Pressure Capacity—Extra safety factors for all standard distribution pressures.

NEW FREE CATALOG

Gives detailed information on AMERICAN DUCTILE Iron products including grades, specifications, tests and typical applications of materials produced with this new metal.

AMERICAN CAST IRON PIPE CO.
BIRMINGHAM ALABAMA

SALES OFFICES
New York City • Dallas
Chicago • Kansas City
San Francisco • Denver
Pittsburgh • Orlando
Minneapolis • Cleveland
Birmingham

Made of malleable iron. Single massive bolt. All sizes, 1/2" to 12" inclusive. For steel, cast iron and Transite pipe.

M. B. SKINNER COMPANY

SOUTH BEND 21, INDIANA, U. S. A.

SKINNER-SEAL SERVICE SADDLE

MARCH 1959

GAS

CORROSION PREVENTION

EDUCATE FOR CORROSION PREVENTION

Corrosion mitigation is a responsibility of all construction and operation personnel—not just that of corrosion engineers. Here's how one company is educating and using all gas personnel for corrosion prevention work (p. 64).

COATING STEEL PIPE

Here in detail is a fully developed pipe coating program of a major gas company. Highlights are the coatings specs, application techniques, inspection, handling and quality control methods found efficient and practical (p. 129).

LEAKAGE CONTROL

Corrosion prevention and leakage control are directly related. This article details leakage control techniques and integrates these operations with a cathodic protection program (p. 72).

PLASTICS PIPE

ADVANCES FOR PLASTICS

Again, GAS has surveyed the industry to determine the progress of plastics pipe in gas system plant. This survey report (p. 75) reflects the relentless advance of the material and the vigor with which some gas companies approach plastics application.

SERVING AGRICULTURAL AREAS

Plastics piping is bringing natural gas service to an agricultural area in New Mexico where gas service would be economically unfeasible without this material. Here's how Western Gas Service Co. is doing the job (p. 78).

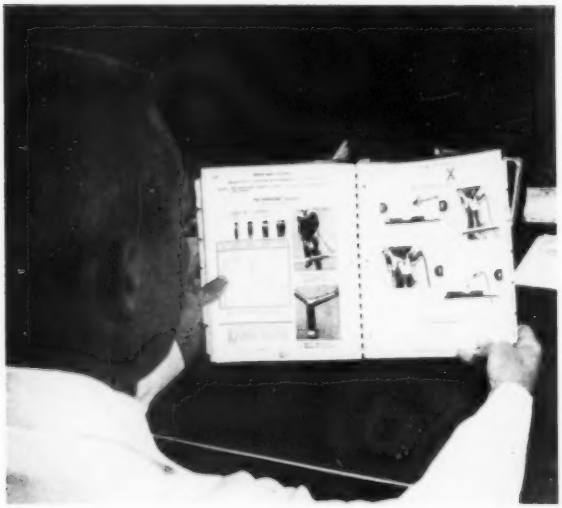
SERVICE RENEWALS

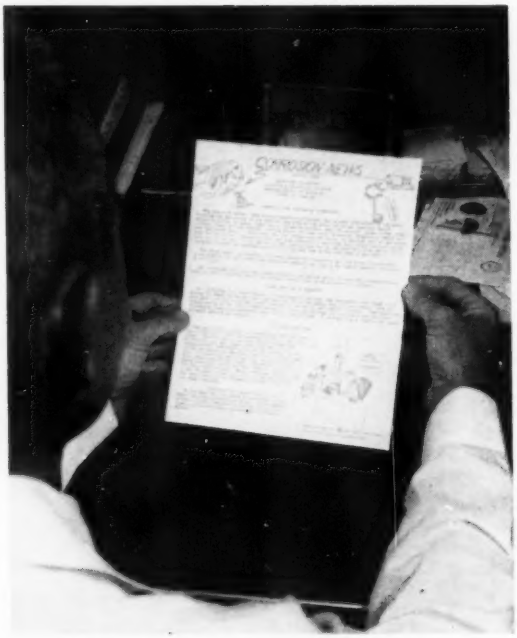
Rising unit costs and an increase in the number of service replacements prompted a Kansas-based combination company to explore plastics insertions for service renewals. Results: "Highly successful." Read this article for a step-by-step how-to-do-it treatment (p. 83).

Cooperation + Know-How = Successful

Corrosion education is a must on a system-wide basis in order for any corrosion mitigation program to be successful. Shown here is the staff of a recent corrosion short course put on by Montana-Dakota's corrosion personnel. Theoretical aspects of corrosion elimination are kept to a minimum. Practical demonstrations are considered to be the most beneficial.

A corrosion and cathodic protection manual is a necessity in order to wage a successful campaign against corrosion. The supervisor below is referring to a section on hand-applied coatings in Montana-Dakota's manual. The manual is distributed to all key operating and service personnel and anyone else who desires one.





Any method by which the corrosion prevention program can be kept in the minds of operating and servicemen is beneficial. Here a supervisor reads a monthly corrosion bulletin. Later it will be posted on the bulletin board.

CORROSION MITIGATION

of a small but widespread operation

By DAVID P. PRICE, Corrosion Engineer

Montana-Dakota Utilities Co., Glendive, Mont.

FOR many years, corrosion mitigation has been looked on as a highly specialized work by too many of the people in the pipeline industry. They have had the attitude: "Let the corrosion engineer worry about it!"

Many times, jobs are completed and pipelines laid before the corrosion engineer is consulted in regard to coatings and cathodic protection. The result is needless added expense and many times less effective pipe protection in the end. It is true that most of the designing and testing must be done by the corrosion engineer, but most of the actual coating work and much of the cathodic maintenance work must and can be done and supervised by the man in the field. No utility company is financially capable of hiring enough corrosion engineers to supervise all phases and details of coating and cathodically protecting the pipe on all construction in cities, on main pipelines, at compressor plants, and in the gas fields.

It is virtually necessary to educate all company personnel in the rudiments of corrosion prevention. The more people who can be instructed and interested in corrosion elimination practices, the more effective a program will be. All can and should help. Each employee should be made to feel that his contribution to the corrosion prevention effort is necessary and extremely valuable. In this way and only in this way can we hope to realize the utmost benefits from our corrosion programs. The rising cost of raw materials and labor makes it a necessity for us to preserve the estimated $14.7 billion of underground pipelines in the United States. Here is how one utility company is educating and enlisting the aid of all gas personnel in corrosion prevention work.

• Operational Scope

Montana-Dakota Utilities Co. serves about 85,000 gas customers through 1900 miles of transmission pipeline in 95 towns and cities over a four-state area in the northwest. Most of the distribution systems are company-owned. The company owns and operates several gas fields and also purchases gas from various other sources throughout the properties. Three of the company's gas fields are used for storage purposes during the summer months and are produced to meet the large gas demand during the winter time. About 700 gas wells are owned and operated.

From this brief sketch, it can be seen that Montana-Dakota Utilities Co. owns and operates facilities for producing, processing, storing, transmitting and distributing natural gas. All of the underground structures are in soil that is moderately to severely corrosive. The coating and the cathodic protection of underground metal is definitely a must, but because of the scope of operations, the corrosion prevention program is necessarily too large for all phases to be handled by personnel assigned strictly to corrosion mitigation work. With this fact in mind, it has been necessary to set up a program in which the part time services of operating men in the various divisions are utilized. The program, although it is not completely perfected, has resulted in a very marked decrease in distribution system gas leaks over the past six years. The number of corrosion leaks

occurring on bare transmission lines is down to a fraction of what they were several years ago and no corrosion leaks are occurring on the coated transmission lines.

• General program

Main Transmission Lines: The first transmission pipelines, installed by the company in 1928, 1929, and 1930, were coated with a grease-type coating, which, in subsequent years, deteriorated so that the pipe is now bare. Cathodic protection of one of these pipelines was reported on in detail in GAS 34: 119-125, March 1958, by the writer and Ray Wainwright. All transmission lines have been coated with a coal tar enamel coating with asbestos felt outerwrap since 1933. The performance of this coating has been excellent over the ensuing years. For the past few years, a glass reinforcement has been added to the coating specifications.

All the main pipelines and compressor stations are supplied with cathodic protection current. In regard to the coated pipelines, there is no problem in cathodically protecting them. However, with the uncoated or partially coated pipelines, many cathodic protection units are naturally required which increases maintenance problems.

Gas Fields: The gas field gathering pipelines were originally laid bare but have since been replaced, of necessity, with coated pipe. These pipelines are all cathodically protected. An insulating flange, in each wellhead, confines the protective current to the well lines. At the present time, a program of supplying cathodic protection to the well casings is in progress. This is being done by adding more rectifiers and draining a predetermined amount of current from each well by means of a resistance bond installed in a terminal box fastened to the wellhead.

City Distribution Systems: All of the newer coated distribution systems are cathodically protected. The older distribution systems are in the process of being prepared for cathodic protection at this time. A service line insulator is installed in each service line to confine cathodic protection current to the gas system. Protective current is obtained from small distributed rectifiers located away from the proximity of "foreign" structures. The other underground metallic structures are checked for stray current pickup during the annual potential survey of the gas system. In most cases, no current pickup is discernible on "foreign" structures. In distribution systems where it is known that complete cathodic protection will not be achieved for several years, magnesium anodes are installed in "hot" spots whenever it is necessary to break ground. All piping installed is mill-coated with a coal tar enamel, glass reinforcer, felt outer wrap, and Kraft paper. Joints and fittings are coated with a hot-applied coal tar tape.

• Corrosion Education

Approximately every two years, a corrosion short course is presented to the service and gas distribution men in each division. At these meetings, talks and demonstrations are given concerning mill-applied coatings, hand-applied tapes and coatings, service line insulators, flange insulation, magnesium anode installation, rectifier installation and maintenance, corrosion report forms, and other miscellaneous related subjects. Each year, a talk is given at the company's gas operating meeting to the gas superintendents and the fore-

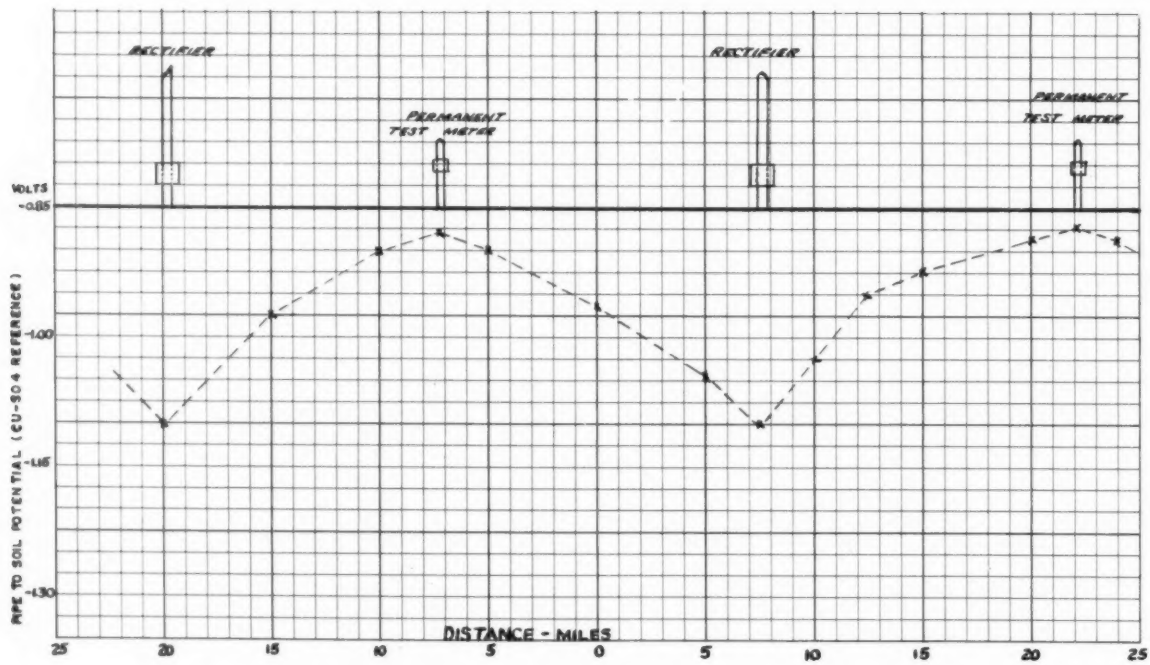


Fig. 1. Diagram of permanent test meters' location in relation to rectifiers and potential profile.

Form 314 Rev. 8-54

MONTANA-DAKOTA UTILITIES CO.

GAS LEAK AND REPAIR REPORT **A** **7976**

(Send to Pipe Line & Production Dept., Glendive, Mont.)

Division:..... **Town:**..... **Date:**.....
Leak On (Check One): Field Line.....; **Transmission Line**.....; **Distribution Main**.....; **Service Line**.....
Location (for map plotting): Transmission Line No......; **Line Name**.....
Leak Located.....**feet**.....**from Marker Post No.**.....
Distribution Map Page No......: **(Describe specific location of leak below. See instructions.)**.....
.....
.....
.....
Pipe Diam......**In.; Depth**.....**In.; Length Exposed**.....**Ft.; Leak on: Top**.....; **Bottom**.....; **Side**.....
Leak at: Threads.....; **Coupling**.....; **Weld**.....; **Pipe Surface Area**.....; **Other (Describe)**.....
Pipe Bare.....; **or Coated**.....; **If Coated: Type:**.....; **Condition: Excel**.....; **Good**.....; **Fair**.....; **Poor**.....
Soil Conditions: Sand.....; **Clay**.....; **Loam**.....; **Other (Describe)**.....; **Moisture: Dry**.....; **Damp**.....; **Wet**.....
Describe Nature of Corrosion and Pipe Condition:.....
.....
Repairs Made:.....
Repair Coating Type: Hot Enamel and Asbestos Felt.....; **Service Cement**.....; **Tape-Coat**.....; **Plastic Tape**.....
Anodes Installed: How Many.....; **Anode Weight**.....**Lbs.; Depth Installed**.....**In. (Measured to Anode Top)**
Date Leak Detected.....; **By Whom**.....; **Date Repaired**.....
Remarks:.....
.....

(Refer to Instructions on Back of Cover) **Signed**.....

Fig. 2. Accurate leak records are an essential part of any effective corrosion program. Personnel should be intimately acquainted with preparation of leak repair forms.

men concerning new developments in corrosion mitigation work and reviewing present operations.

During the year, sales representatives, of approved hand-applied coating firms, put on wrapping demonstrations or observe wrapping methods to be certain that the hand coating operations are done correctly. The coating of joints and fittings in distribution systems is considered to be one of the most important jobs done by the men in the field. Each time a corrosion engineer visits a division, he makes it a point to inquire about coatings, insulators, and cathodic protection in general. This presents an opportunity to get more suggestions and instructions to the men who do the work.

Each month, a mimeographed one-page corrosion bulletin is distributed to the gas divisions for posting on the bulletin boards. This gives the corrosion department a chance to keep the men up-to-date on new developments and to review existing corrosion prevention procedures. This bulletin takes only a short time to prepare and is considered worth the time. It serves as a reminder to the men whose main duties lie elsewhere but who are, nevertheless, relied upon for part time corrosion work.

• Corrosion and cathodic protection manual

A Corrosion and Cathodic Protection Manual was prepared by this company in 1953 for distribution to all key men in the field. This manual contains a table of contents, and sections on fundamentals, anodes, bonding, coatings, ground beds, instruments, insulation, rectifiers, reports, and test leads. Each section is tabulated so that it can easily be referred to. The pages are numbered by the section letter and by page so that it is very easy to distribute new material for insertion in the manual which is in a looseleaf form. Each year, additions and changes are made by sending the holder of each manual the new material with a letter of instructions.

The Corrosion and Cathodic Protection Manual contains pictures and instructions concerning all coatings that are approved for usage. Complete coating specifications are included so that contracts for construction can include in them these specifications. Only the hand-applied coatings listed in the manual are approved for usage on joints, fittings, and valves. Instructions are included for the handling and storage of mill-coated pipe. The correct installation of magnesium anodes is covered in another section of the manual. Instructions are given concerning anode locations on new construction and on old pipe so that it is not necessary for the corrosion engineer to make recommendations for each particular job. Pictures and diagrams are employed in this section also to make the instructions clearer.

A complete section is devoted to the insulation of service lines in cities and to flange insulation of mainlines. Only the insulators approved for usage are shown in this section. Specific instructions are given regarding the insulation of these insulators. The manual, in effect, contains instructions and information regarding all phases of corrosion control work. Additions and improvements made each year are designed to cover any and all questions that the men might have regarding all phases of the work.

Field man obtaining a.c. consumption meter data to be sent in to corrosion department. Each rectifier is checked at least once a month and a report submitted. From these data rectifier efficiencies and power consumptions are calculated.

Corrosion engineer calibrates permanent potential testmeter. Meter is mounted in weatherproof box. Meter is made specially to give reading comparable to one obtained from copper-sulfate electrode, but uses a permanent buried zinc reference.

• Rectifier inspection and reports

Certain men in each district have been assigned the job of inspecting the rectifiers in their vicinity at least once a month. A report is made up on a standard form and is submitted to the corrosion office. The information obtained in this manner is compiled on summary forms. From these data, rectifier efficiencies and kilowatt-hour consumption are calculated. Any irregularities are noted on the report form so that if need be, a maintenance man can be sent out from the corrosion office to correct the trouble.

If, because of varying ground moisture conditions, a rectifier needs re-setting, the person checking the rectifier does this on his inspection tour. All of these men have been taught the rudiments of the rectifier and can re-set the input voltages. Each rectifier is tagged, with the desired amperage output noted thereon, so that the checker can refer to the tag to determine whether or not the unit requires re-setting. In this way, a reasonably steady rectifier output is maintained in all seasons.

• Permanent pipe-to-soil voltmeters

About two years ago, permanent voltmeters were installed on the coated pipelines at locations approximately mid-way between the rectifier locations (see *Fig. 1*). These meters were manufactured by the Agra Instrument Co., Tulsa. They are mounted in weatherproof boxes and are attached to marker posts at the desired locations which are near the location of the pipe-to-soil potential reading reflecting the lowest level of protection between two rectifiers. A zinc anode, which serves as the reference electrode, is buried in soil that is permanently moist below the pipeline level. The voltmeter is especially built so that the reading to the zinc reference electrode is comparable to that which would be obtained from a copper sulfate electrode.

These meters are checked monthly by the men who check the rectifiers and the readings are fowarded to the corrosion office. The voltmeter readings are plotted on cross section paper on which is reflected the latest complete potential curve of the entire line. It is a simple matter of extrapolation to obtain a close approximation of the entire existing potential curve. A detailed potential survey is made yearly by corrosion department personnel. At the time of this survey, the check meters are calibrated. The meters usually check out to within 50 millivolts of the reading obtained by a potentiometer and copper sulfate electrode.

In some of the small cities also, permanent voltmeters have been installed. They are checked at least once a

week, especially when new service lines are being installed. A faulty service line insulator will drop the pipe-to-soil potential so that if this is noted, the local man can check over recent work for faulty insulators. A report of these readings is received monthly by the corrosion department so it is easy to determine the status of protection in these cities.

So far, these voltmeters have remained surprisingly accurate provided the electrode is in ground where the moisture content does not vary greatly. If the zinc electrode is not buried deep enough so that moisture content around it varies, the voltmeter does not hold its accuracy. If correctly installed, the permanent voltmeter station is a valuable aid in controlling pipeline cathodic potentials if only a limited number of corrosion personnel are available to cover an extensive area.

• New pipelines

On new pipelines, inspection of coatings is performed by a group of men working under the pipeline field superintendent. They have all had a number of years experience in this work so that a good coating job is assured. All of the pipe is put to a holiday detector test and holidays are patched to the inspector's satisfaction. All of these men have had from 10 to 20 years experience with coal tar coatings, so it is felt that there is no need to continuously keep a corrosion engineer with new construction work.

Groundbeds are installed by the mainline maintenance crews in accordance with specifications set up by the corrosion department. It is generally not necessary to have a corrosion engineer on the job when groundbed installation work is being done.

• Leak reports

Each time a leak is repaired in a city or on a mainline, a standard leak report form is completed and the original copy is forwarded to the corrosion department. A complete set of maps is kept in the corrosion office for all distribution systems and mainlines. Leak information from cities is plotted on detail city distribution map sheets; and on mainlines, the information is plotted in leak books. In this way, an accurate analysis of leaks can be made by the corrosion department annually.

To be certain that no leaks are missed and to draw each division's attention to the "corrosion picture," each division is required to make a yearly summary of all gas leaks repaired in the particular division. There is no need to point out that a leak in a city is much more dangerous than a small leak out on a main transmission line. Much attention is given to the locating and repairing of gas leaks in cities. *Fig. 2* shows the form that each foreman must complete after a leak has been repaired.

• Reports

During the winter "in period," an annual report is prepared for management in which is contained a short report concerning the status of protection on all main transmission lines, gas fields, compressor plants, and city distribution systems. Potential charts and maps are prepared to graphically present the cathodic protection picture where ever possible. The report, in book form with tabulated sections, is an invaluable reference for both management and corrosion personnel. Future planning is also incorporated in the annual report so that if unforeseen circumstances remove one or all of the corrosion engineers from their positions, it will be easier for the work to be continued as originally planned.

An effort is made, within the corrosion department, to keep all personnel informed concerning all affairs in regard to corrosion mitigation work. All incoming and outgoing correspondence is read and initialed by all corrosion engineers before it is filed. Many times, the work can be expedited because all departmental employees are familiar with the various phases of the current operations.

In addition to the annual report, detailed reports are made concerning each main pipeline and each distribution system at the conclusion of each potential survey. These reports are directed to supervisors and management—both locally and in the main office. With this particular company, top management is firmly behind the corrosion elimination effort which is very gratifying. In return for their support, management is entitled to concise but thorough reports concerning the status of corrosion and cathodic protection throughout the properties.

• Conclusion

In order to successfully combat corrosion on a systemwide scale, the interest and assistance of all of the operating and installation men must be obtained. The men must be schooled so that they know how to help with the program and know the reasons for cooperating. A manual containing instructions and information on all phases of the cathodic protection and coating program is absolutely necessary. Schools aimed at the men, who actually do the work, are very helpful. Any means, by which the corrosion program can be kept in the minds of operating personnel, should be employed. It will be found that the men are enthusiastically willing to help if they can see the reasons for doing so and if an occasional "well done" is passed along. Communications between the corrosion department, management, and the operating personnel, is a must. Corrosion is a problem that should concern everyone. Corrosion can be eliminated from any system only if all are concerned and if all participate in the campaign against it. ■

Designing for minimum cathodic protection interference

By C. A. ERICKSON, Corrosion Engineer
Peoples Natural Gas Co., Pittsburgh

One of the most aggravating and costly steps in the protection of a pipeline against corrosion is the elimination of cathodic protection interference on other underground structures. Anything that can be done in the design stage to minimize these problems is time and money well spent.

WHEN cathodic protection is applied to a pipeline to prevent corrosion, current is discharged into the earth at a remote point from an expendable ground bed. The current radiates through the soil seeking to return via the pipeline to the source, the rectifier. If any foreign underground structure lies in the current's path, part of the current will collect on it, travel on the structure toward the pipeline—it being a parallel resistor—and discharge to ground at or near the crossing with the pipeline. At the point of discharge, corrosion of the foreign line will occur—its severity depending upon the quantity of current discharged to ground. This accelerated corrosion is said to be caused by "interference."

Since one is responsible for the current which he discharges into the earth, the company installing the cathodic protection must eliminate interference to the satisfaction of the foreign structure owner. There are many ways to eliminate interference, such as resistance bonds, insulation, isolation, and shielding.

The purpose of this article is not to discuss the elimination of interference but rather to suggest some steps which, if taken during the design stage, will minimize interference and make it easier to clear.

The first consideration is to pick a pipeline route which, other things being considered, will require the least amount of cathodic protection current. The interference must be less if the output of the rectifier is small.

The corrosion engineer should help select the proposed route in order to avoid aggressively corrosive areas. By measuring soil resistivities along the proposed route, he can locate highly corrosive areas. These should be avoided if possible.

It is appreciated that pipelines are constructed at a given cost per foot and that the shortest line is the cheapest one. However, if offsetting the line to the right or left will avoid multiple stream crossings, multiple road crossings, dumps, cinder or ash fills etc., it will be worth the cost of a few extra feet of pipe in future maintenance.

It is impossible to have interference problems if the pipeline is remote from all other underground structures. Of course, this is impossible, especially in metropolitan or production areas, but it should be considered. Avoid "pipeline alleys" if possible.

When pipelines cross at right angles the interference is easier to eliminate than when the lines cross at a long angle.

Where lines do cross, interference will be less if the lines are separated as much as possible. When the separation is 2 or 3 ft, the interference is easier to clear than when the separation is only a few inches.

In many areas of the country the corrosion engineers of the various companies owning underground plant meet periodically to discuss mutual problems. They call themselves Coordination or Electrolysis Committees. The National Association of Corrosion Engineers lists these committees and their offices every third month in "Corrosion" under Technical Practices Committee T-7.

Where one of these committees exists, maps of the proposed route can be supplied to the members in duplicate. Each then will indicate line crossings on one print and return it. This puts each member company on notice of the proposed route.

Moreover, it will supply the builder of the pipeline with the location of the foreign structures along the proposed route. This pattern of foreign structures will be of great value in the planning of cathodic protection installations.

Perhaps the greatest single factor in minimizing interference is a good coating on the pipeline. Cathodic protection currents protect the metal which is exposed to the environment. Thus, it follows that the better a pipeline is covered with a permanent, tough, electrical and moisture barrier the less metal will be exposed. The smaller area of exposed metal will require a correspondingly smaller amount of current to protect it and the interference will be reduced by the same ratio.

Theoretically, if a coating were perfect and would remain perfect, no cathodic protection would be

needed. However, this is impossible and is very expensive even to approach.

The flaws in the coating are primarily construction damage or occur at a later date due to penetration by rocks or sharp objects in the backfill. It is generally good practice to have a tough outer "skin" to protect a coating. Where backfill conditions are severe, the use of Rock Shield is desirable.

Most companies specify a good coating and minimize imperfections by rigid inspection. The exposed metal at the penetrations is then protected with cathodic protection.

It is necessary to have an electrical contact with each pipe at a crossing when interference tests are made using potentials to earth. It will save digging the crossing at a later date if test wires are attached when the ditch is open.

Normally the new line will go under the existing line so both lines will be exposed. Attachment of the wires and repair of the coating is easier and cheaper in the open ditch.

The wires are terminated in an appropriate test box and care should be exercised during backfilling so as not to damage the wire connections.

Insulating joints have been called "electrical valves" in a cathodic protection scheme. Just as valves are used to control the flow of gas or liquids in a pipeline, insulating joints can be used to control the flow of cathodic protection currents in a pipeline.

Judicious use of insulating joints will provide great flexibility in controlling the "spread" or area affected by a cathodic protection unit.

This kind of control can mean the difference between a costly interference problem and one that is simple to clear.

So far the suggestions have been aimed at minimizing problems by attention to details of construction. By making the pipeline easier to protect there will be more latitude in the selection of protection.

The corrosion engineer can then base his selection on cost and efficiency alone and not be limited by circumstances to a single procedure.

If a pattern showing the structures that will be affected by a rectifier is known, it is possible to locate a ground bed at a point where interference will be a minimum. If possible, the ground bed should be installed at that location.

Usually other factors such as soil resistance, accessibility of a.c. power, and rights of way make the location unsuitable for a ground bed. However, the nearer the ideal location a suitable ground bed can be installed, the better it will be from an interference standpoint.

Much has been written about deep anodes and the claims of little or no interference are well founded. Since only a small surface area is required for the installation, rights of way are generally not a problem. Investigation will usually indicate that there is a low resistance strata not too far below any proposed site. It is not too much more expensive to drill a hole a couple of hundred feet deep than it is to dig 200 ft of ditch for the anodes.

This pin-pointing of anode ground beds gives the corrosion engineer a greater selection of sites and makes it easier to locate ground beds remote from foreign structures.

Low soil resistance for a ground bed is important economically and search should be made for the best low resistance location. This will also keep voltages on the rectifier low and limit the spread of interference currents.

Study should be made of more than one system for cathodic protection. If cathodic protection can be attained for approximately the same outlay of money, several small rectifiers, instead of one large capacity unit, will result in fewer interference problems. The same would be true for a multiple or distributed anode bed in preference to a large localized ground bed.

When lines are well coated, protection can be attained by the use of expendable galvanic anodes. Due to their low current output and small driving potential, interference in these systems is usually small enough to ignore.

Magnesium anodes work well on coated distribution mains and services. These are usually in congested areas where there would be a multiplicity of interference problems.

It is sometimes possible to use galvanic anodes in conjunction with rectifiers. The output of the rectifier can be adjusted to give a minimum effect on a foreign line. Usually the pipeline will not be protected at the crossing when this is done. Galvanic anodes can be used to supplement the rectifier in the areas near foreign line crossings.

Magnesium has also been used as a shield at pipeline crossings. Although this is an expensive procedure and requires much testing, it will prevent high voltages across the coating on a foreign line.

Near metropolitan areas it is sometimes impossible to avoid "pipeline alleys." There is just no other place to lay the line.

When this happens joint cathodic protection with other companies will minimize interference.

The cost of a pipeline should be figured on a per year basis for the proposed life of the pipe. It is often found that cheapest initial cost is not the least expensive on a per year basis due to high maintenance costs.

One of the costs on a per year basis is the cost of power to operate cathodic protection units. If a large percentage of the current from these units is being used to satisfy interference problems, the cost of useful current will be high.

Let us suppose that it requires 50 per cent of a rectifier's output to clear interference problems. This means that 2 amp must be purchased to derive benefit from one or the cost for power alone is doubled.

Most underground structures are in the earth by right-of-way only. This means the pipeline may be laid, maintained, and removed. It does not mean that the earth is owned.

Just as a company is held responsible if it pollutes a stream, a company must assume the responsibility for any current which it discharges into the earth.

Anything that can be done to eliminate or minimize stray currents from cathodic protection units will be good engineering and will be appreciated by the owners of neighboring underground pipelines. ■

Reducing unaccounted-for gas by a

Leakage control and corrosion prevention program

By TRUEL E. ADAMS, Corrosion Supervisor
Consolidated Gas Utilities Corp., Oklahoma City

MANAGEMENT is vitally interested in the problem of leakage because of its effect upon earnings. Leakage and corrosion of the underground plant are directly related.

Only an effective corrosion prevention program can provide management with the monetary savings gained through reduction of unaccounted-for gas.

Some of the methods used by Consolidated Gas Utilities Corp. in its leakage and control program are briefly covered here.

Mill coated and wrapped pipe has been used for eight years on maintenance and construction projects in our transmission and distribution systems. This standard was adopted to insure uniformity of coating on our lines.

Anodes are installed at the time of construction except on major transmission jobs. New pipe is insulated from sections of old pipe and meter installations are insulated at the point of consumer's premises. A pipe-to-soil check is made twice a year on these sections of pipe to verify the protective potential.

On older transmission lines, the surface potential or two-electrode method is proving very successful in locating hot spots, replacement sections, and anode locations. About 60 to 70 miles of this work is done annually.

Fig. 1 is the form we use on transmission line surveys. Our standard spacing between electrodes is 16⅔ ft on Dresser-coupled lines and 20 ft on bare welded lines. Electrodes are checked several times daily to insure that they are within two millivolts of being equal. Millivolt readings are recorded in the "reading" column. Unusual objects—everything from cow trails to fences or large rocks—are listed in the "remarks" column. Such notations provide ready reference if it is necessary to secure additional data in the area. The explosive meter was not used in transmission line surveys until recently.

(*Text continues on page* 74)

Cathodic Protection Memo No. 1

In order to perform maintenance and construction functions at the lowest possible cost, effective immediately, all anodes will be installed by the regular transmission and distribution crews, as a part of their regular duties since it it not necessary that a corrosion serviceman or corrosion technician actually install the anodes. This applies to anode installations or services, short line extensions, etc., as well as larger and special jobs.

The cathodic technician will make recommendations as to size and number of anodes from office records or a field test. It will be the duty of the transmission and distribution foremen to provide the cathodic technician with certain information on the CATHODIC PROTECTION FIELD INSTALLATION AND CHECK SHEET in order that the division records may be maintained. These forms are available from the cathodic technician.

If the transmission and distribution crews are unfamiliar with the procedure of installing anodes, the cathodic technician will provide the necessary instructions.

All construction job orders must be routed over the cathodic technician's desk for his recommendations before directing job order to the division auditor. The cathodic technician must process this portion of the job with dispatch to avoid delay in the channeling process.

Cathodic Protection Memo No. 2

The following instructions have been prepared to clarify the cathodic protection program and to provide personnel with information as to what they are to expect from the program and the cathodic technicians.

● Cathodic protection program

1. Anodes shall be installed on all newly laid, coated lines as a part of the line construction, provided that the technician has ascertained the anodes can operate, and that the section of lines installed cannot be protected with anodes already in service on adjacent connected lines.
2. Anodes may be installed on lines where leakage is troublesome.
3. A systematic program for installing anodes on existing coated lines is recommended where corrosion trouble is anticipated.
4. Cost estimate of technicians should be the basis used by the division managers in making decisions as to the desirability of protection on existing lines.
5. Where it is apparent that rectifiers are required, the corrosion supervisor shall be called on to either check or prepare the design and specifications.
6. All personnel connected with pipe installation shall be alerted to avoid contact of our mains with water mains, water service lines or any pipelines or underground metal structures of other companies.

● Insulation

Distribution mains: All newly laid, coated mains (whether replacement or new construction) shall be insulated from older, uncoated mains. Coated mains being connected to coated mains shall be bonded at the point of connection on recommendation of cathodic technician to provide an uninterrupted current flow.

Service lines: All coated service lines when connected to newly laid mains shall be insulated as follows:

1. Short alley services to upright meters with an insulating meter spud or equivalent. Street or alley services to underground curb meters, with an insulating meter spud or equivalent.

NOTE: Care should be taken that the cast iron meter box or curb box does not make contact with coated lines.

2. Long coated services, at the point where customers' lines join company service with an insulating Dresser coupling.
3. Uncoated service lines when connected to coated mains shall be insulated at the main with an insulated coupling.
4. All new coated (company owned) service lines of 20 ft or more connected to a bare main will be insulated at each end.

Transmission lines: On newly laid transmission lines, insulation shall be placed as follows:

1. On one side of all mainline sectionalizing valves.
2. On all braces and by-passes around mainline valves.
3. On the take-off or junction of all lines connected to mainline, including connections to gasoline plants or compressor stations.
4. At valves on all highway bridge or underground river crossings.
5. Underneath pipe at supporting structures such as "A" frames at creek crossings.
6. On mainline services with an insulating meter spud or equivalent.

Replacements of bare transmission line pipe with coated pipe or 100 ft or more to be cathodically protected shall be insulated at both ends of the replacement, unless the cathodic technician is of the opinion that an exception can be made on the basis of existing condition.

● Coating program

All permanent mains and transmission lines shall be coated and wrapped, except where soil resistance is sufficiently high to warrant exception.

All new service lines shall be coated.

All joints shall be coated with Bitumastic 50 and ProtectoWrap or equivalent.

On large construction jobs, a holiday detector should be used on all coated pipe, and joints shall be jeeped and holidays patched and pipe jeeped again prior to lowering pipe.

All coated pipe shall be handled into the ditch with slings.

● Duties and responsibilities of technicians

1. Advise supervisor responsible for work as to the possibilities of cathodic protection in any given situation.
2. Furnish supervisor with estimates of requirements and costs.
3. On larger jobs, supervise installation of anodes. Install or supervise installation of insulating equipment.
4. Test anode installations and insulating equipment periodically.
5. Prepare and maintain neat up-to-date record of all installations and tests.
6. Prepare map records of the exact location of all anodes or, provide data so such a record can be maintained by other employees.
7. Maintain cathodic protection instruments.
8. On special assignment, prepare maps of soil conditions based on surveys or general knowledge of areas.
9. Advise and cooperate with division manager in anticipating requirements of cathodic protection materials.
10. Consult with corrosion supervisor concerning unusual problems.

● General

Technicians may be permitted to purchase locally such items as solder, miscellaneous wires, batteries, etc., which are not regularly stocked by the store's department.

In general, judging the results of cathodic protection will become easier as all personnel become more familiar with its operation under local conditions. For this reason, good records will prove to be of great value to the supervisors.

Suggestions for the improvement of procedures on records are to be encouraged.

CONSOLIDATED GAS UTILITIES CORP.

SURFACE POTENTIAL SURVEY

STATION	READING	SIDE DRAIN	RESISTIVITY	REMARKS
0+00			10,000 Ω	8" Main line North of McAlester
	+ 20			Sect 30 T6N R15E Pittsburgh Co
	- 22		10,000 Ω	going North at 20' intervals
	- 7			
	+ 8			
1+00	+ 27			
	+ 19			
	+ 16			
	+ 17			
	- 15			
2+00	+ 20			
	- 20		2,000 Ω	
	+ 26			
	- 33		15,000 Ω	FENCE
	- 15			
3+00	+ 7			
	- 37		15,000 Ω	
	+ 36			
	+ 33			
	+ 10			
4+00	- 17		10,000 Ω	
	- 32			
	- 14		6,000 Ω	
	+ 37			
	+ 25			
5+00	- 22		6,000 Ω	
	- 5		6500 Ω	OLD LEAK
	+ 22			
	- 40		1,500 Ω	
	+ 25			
6+00	- 42		10,000 Ω	
	- 5			
	- 26			
	+ 28		6,000 Ω	
	+ 43			FENCE LINE
7+00	+ 31			

Fig. 1. Form for transmission line survey.

In our just completed distribution line surface potential and explosive meter survey in the McAlester, Okla., area, the two electrode method was used with 10-ft spacing on all mains and services. Our seven-man crew was arranged in this order: pipe locator, front electrode, instrument man with rear electrode, note keeper, soil resistivity, and two men with explosive meter and probe rod.

Only one note keeper was needed because the surface potential men and the explosive meter crew worked together. This eliminated the problem of misplaced readings or notes. The line locator used a can of spray paint instead of stakes to mark the line at 20-ft intervals. This permitted all crew members to stay over the line at all times. The soil resistivity was taken at all reversals and zero readings as close to the pipe in original soil as possible. The instrument man called his readings to the note keeper and brought his attention to landmarks. All mains and services on a street were checked thoroughly before the crew moved to another street.

First survey in the McAlester area was started in February 1956 by a consulting firm. When it was completed 10 months later, a total of 142 miles of mains and services were surveyed with 995 leaks reported. Leakage at the time of this survey was 39 per cent or 439,818 Mcf. A study of the field notes was made and it was decided to use magnesium anodes as a deterrent to corrosion. One year after 9,300 anodes of various sizes were installed, the leakage was reduced to about 1 per cent. A net savings of $80,000 annually resulted.

At the beginning of the survey, the explosive meter was not used. After a few bell holes were opened for inspection and soil testing, it was evident that the survey crew was not locating all leaks and we were confronted with anaerobic corrosion. The longitudinal reading did not show these spots as corrosive. At times there would be a reversal—on other occasions there would be all zeroes. Study revealed a very noticeable pattern which was verified in almost every instance by use of the explosive meter.

From all appearance, surface potential wise, there is very little difference between galvanic and anaerobic corrosion in the early stage. Only after a leak occurs does the longitudinal reading decrease as escaping gas causes the corrosive activities of the bacteria to become dormant.

At an average cost of $235 per mile, company corrosion crews surveyed two small distribution plants in the McAlester area and found 423 leaks in 23 miles of line. Repairs and installation of 1500 anodes will be completed by mid-1959.

Fig. 2, the form we use for distribution surveys and anode installations, has spaces for millivolt readings, resistivity, gas tests, remarks, anode sizes and output reading for the installation crew. In this reproduction of an actual page in the Krebs, Okla., survey, note the possible anaerobic spot at the 7 + 10 to 7 + 50 station. This leak was not bell holed during the survey but new pipe was installed from 6 + 90 to 7 + 50 and anodes were installed as indicated by a small cross next to the resistivity column. Crosses in the anode column show anodes were installed and their output was recorded in the MA column. Pipe size is shown at each anode installation.

Because most gas company employees have to be sold on cathodic protection, Consolidated Gas Utilities conducts schools for managers and operating personnel in each division. We find where there is mutual understanding of the fundamentals involved and the overall results obtainable, employees cooperate in the effort to save money through reduction of the amount of unaccounted for gas. ■

Washington Ave. — Surface Potential & MG. Anode Data — CONSOLIDATED GAS UTILITIES CORP. — Krebs - 1001-A-2 Oklahoma

DATE: 4-15-58 — PIPE DIA. 2" — DATA SHEET NO. 3 — MAP NO.

STA.	Test Type	READINGS	Soil Test	Soil Line	Anode	Resistivity	GAS TEST	REMARKS & FEATURES	LOCATION	MA	SIZE
6+90	Dirt	-16				4,000	0				
		+1					0	-9 B.T. Pole			
		+3					0				
		Skip					0	Pipe Showing			
		Skip					0	Pipe Showing			
		+22				4,000	0	-7' P.S. Pole		30	2"
		-8					0				
		0					0	-3' P.S. Pole			
		-6					0	-4' T. South Main			
	Shale	+6			X	10,000 / 4,000	0			28	2"
7+00		-5					5%				
		0					8%				
		0					15%				
		+8	+2				20%	(Stake)			
		0	-2				25%				
		-2	+3				18%	-5 Iron Pole			
		+3	0		X		10%				
	Dirt	0				1,000 / 5,000	0			40	2"
		+2					0				
		0				1,000 / 2,000	0			40	
8+00		+3			X		0	-8 B.T. Pole			
		-3					0				
		-1					0	-6 West End Culvert			
		+1			X	20,000	0	E 5th St			
		-4					0				
		+10					0	-1 Culvert			
		+6			X	750	0	-3 Fire Plug		160	2"
		0					0				
		+4					0	-2' B.T. Pole			
		+9					0	West end Culvert			

Fig. 2. Form used for distribution surveys and anode installations.

Plastics pipe looks to biggest year

By DON WRIGHT, Managing Editor

PLASTICS pipe will have its biggest year yet in the gas industry in 1959, results of GAS' annual survey of plastics usage shows. This year 44 distribution companies have indicated they will install 1.4 million ft of various types of plastics pipe for mains and services.

This 1.4 million ft is the largest forecasted use in the history of GAS' survey. It nearly doubles the 728,000 ft 30 companies reported they would use a year ago.

The 1.4-million ft figure is the anticipated use by existing gas companies. It does not include substantial footage of plastics installed yearly in the Southwest and Midwest by farmers to pipe gas onto their farms for use as irrigation pump fuel. These installations are made by the property owners themselves, and do not show in gas company reports.

And, it is reported that another good market for plastics pipe will soon be found in Florida, where several small municipal gas systems will be built this year coincident with the arrival, for the first time, of natural gas. Many of these systems are now in

GAS survey

Operational users of plastics pipe in 1959

Arizona Public Service Co., Phoenix
Arkansas-Missouri Power Co., Blytheville, Ark.
Associated Natural Gas Co., Blytheville, Ark.
Brazos River Gas Co., Mineral Wells, Texas
Central Electric & Gas Co., Lincoln, Neb.
Central Indiana Gas Co., Muncie
Cheyenne (Wyo.) Light, Fuel & Power Co.
Florida Public Utilities Co., West Palm Beach
Gas Service Co., Kansas City, Mo.
Illinois Power Co., Decatur
Kansas Power & Light Co., Salina
Mississippi Valley Gas Co., Jackson, Miss.
Northern Indiana Public Service Co., Hammond
Northwest Natural Gas Co., Portland, Ore.
Palo Alto (Calif.) City Gas Dept.
Peoples Gas Light & Coke Co., Chicago
Public Service Co. of Colorado, Denver
Sierra Pacific Power Co., Reno, Nev.
Southwest Gas Corp., Las Vegas, Nev.
Springfield (Mo.) City Utilities
Tucson (Ariz.) Gas, Electric Light & Power Co.
United Gas Corp., Houston
Union (S. C.) City Utility Dept.
Victoria Island Gas Co., Nanaimo, B. C.
Western Gas Service Co., El Paso

the planning stage, and will spring into being around mid-year.

● How it will be used in 1959

Of the 44 companies planning plastics pipe installations this year, 25 can be classed as operational, while 19 are still considered experimental in nature—even though they may be using considerable footage in their experiments.

Six of the 44 companies planning plastics installations will be making them for the first time in 1959. Twenty-one others have indicated they'll step up their plastics pipe programs—most of them considerably—this year. Nine others say their plastics installations this year will be carried out at the same rate as last year.

● Significant trends for 1959

The bulk of plastics pipe used last year was for service inserts—and it will continue again in 1959. However, a trend toward more widespread use of the material for new mains is definitely developing.

These companies will install plastics mains in 1959

Arkansas-Missouri Power Co., Blytheville, Ark.
Arizona Public Service Co., Phoenix
Associated Natural Gas Co., Blytheville, Ark.
Central Electric & Gas Co., Lincoln, Neb.
Florida Public Utilities Co., West Palm Beach
Palo Alto (Calif.) Gas Dept.
Southwest Gas Corp., Las Vegas, Nev.
Tucson (Ariz.) Gas, Electric Light & Power Co.
Western Gas Service Co., El Paso

Biggest reason for this trend, in addition to the fact that plastics are now proving themselves to the satisfaction of many gas engineers, is economic.

The lower initial cost of plastics pipe has made it possible for some distribution companies to provide natural gas service for some less populated areas whose present, and potential, load would not make it feasible to install a more expensive steel pipe system. Elsewhere in this issue, James V. King, manager of operations for Western Gas Service Co., El Paso (formerly Lea County Gas Co.), describes how his company has made widespread use of plastics mains for a rural distribution system—a system which couldn't have been built economically with other types of pipe.

Economic use of plastics also has made it possible for Southwest Gas Corp. (Las Vegas, Nev.) to provide natural gas service to some sparsely populated residential areas in Barstow (Calif.) and the surrounding California desert area. Another company which is using plastics to serve areas that otherwise would be forced to depend upon more expensive bottled LPG is Tucson (Ariz.) Gas, Electric Light & Power Co. Arizona Public Service Co. (Phoenix) has announced its intention this year of using plastics to build a new system in a community which is now without natural gas service, and doesn't have the load (or the potential) to merit a more expensive steel pipe system.

This trend toward more use of plastics mains is not necessarily confined to the desert regions of Texas, New Mexico, Arizona and California—although these regions are the biggest users to date. The Palo Alto (Calif.) municipal gas department is making rather widespread use of plastics mains in certain parts of its system in the Peninsula area of San Francisco bay. Plastics pipe is used by Palo Alto "where economics and service conditions warrant."

● Trends in geographic use

An interesting trend that definitely is developing in plastics pipe usage is a geographic one. Areas that have been served strictly by natural gas have been using the material for the longest time.

Now, as natural gas service has spread to almost all of the U. S. and Canada, the use of plastics pipe is spreading, too.

Natural gas became available in the Pacific Northwest for the first time in 1956. Last year, Northwest Natural Gas Co. of Portland, Ore., made its first experimental installations with plastics—using 100 ft for service inserts. They apparently liked it—this year, they'll use up to 10,000 ft more, also for inserts. So far, Northwest Natural is the only Pacific Northwest utility to begin using, but several others are watching it closely.

Its use also has spread to British Columbia. The Victoria Island Gas Co. of Nanaimo, B. C., tried it experimentally late last year for its propane-air system. This year, they, too, will use it more extensively.

For years, New England gas companies shied away from plastics because of its adverse reaction to manufactured gas. Now, with more and more of that area

being converted to straight natural, these companies, too, are revising their thinking. The first company to do any real experimentation with plastics in the New England area is the Bridgeport (Conn.) Gas Co. In 1958, this company put in 500 ft of experimental inserts—they plan to double this figure this year. Undoubtedly, the results of Bridgeport's experiments will be watched closely by other New England companies.

Another area where a lot of interest is now being shown in plastics pipe is Florida. By mid-year, nearly all of Florida's gas distribution systems will be converted to natural. Florida Public Utilities Co. (West Palm Beach) put in 11,780 ft of plastics last year, for new mains (5380 ft) and new services (6400 ft) to handle distribution of LP-air gas. This year, they'll add another 18,000 ft to their system.

Another Florida company, Gainesville Gas Co., indicates it will begin some experimentation this year, when natural gas is available.

● Industry leaders in use

Southwest Gas Corp. (Las Vegas, Nev.) has emerged now as the industry's biggest user of plastics pipe. The 437,000 ft put in the ground last year gave them a total of 3.1 million (for mains and services), and boosted them ahead of Southern California Gas Co. (Los Angeles), which installed 3 million ft several years ago, and is still evaluating its performance before embarking on a new program.

Third place in the standings goes to Peoples Gas Light & Coke Co., Chicago, with some 1.7 million ft (all in inserts) in use.

Experimental users of plastics pipe in 1959

Arkansas Western Gas Co., Fayetteville
Bridgeport (Conn.) Gas Co.
Brooklyn (N. Y.) Borough Gas Co.
Cabot, Godfrey L., Inc., Charleston, W. Va.
*Central Illinois Public Service Co., Springfield
*Gainesville (Fla.) Gas Co.
*Greenfield (Ind.) Gas Co.
*Houston (Texas) Natural Gas Co.
MidSouth Gas Co., Little Rock
Michigan Consolidated Gas Co., Detroit
Milwaukee (Wis.) Gas Light Co.
New Orleans (La.) Public Service Co.
Pacific Gas & Electric Co., San Francisco
*Pennsylvania Gas Co., Erie
Peoples Natural Gas Co., Pittsburgh
Texas Southwestern Gas Co., Bellville
*UGI—Harrisburg (Pa.) Gas Division
Union Gas System, Independence, Kan.
Wisconsin Public Service Co., Oshkosh

*Indicates companies planning first experimental uses this year.

● Types of plastics pipe used

The biggest percentage of service line inserts last year were made with butyrate pipe. Since the biggest portion of plastics pipe used was for service inserts, it naturally follows that butyrate pipe led the way in usage.

Butyrate pipe has grabbed this position of prominence because its physical characteristic (flexibility) makes it extremely easy to use for insertions. And, since it is available from most extruders in coils, it is easy to handle.

PVC and Kralastic ran about neck and neck, according to the GAS survey, for use as new mains and service lines.

A new high density, high molecular weight polyethylene plastics pipe entered the picture during the past year, and has been used rather extensively by one midwestern utility for new mains and services, and for inserts in existing mains and services. This polyethylene pipe reportedly has good characteristics in sub-zero weather.

There seems to be increased interest, too, in the raw materials side of the plastics pipe scene. At least one major petrochemical company is investigating the possibility of manufacturing the raw materials furnished to the extruders. This company may get into the business before year's end.

● What's ahead for plastics

As usual, the big stumbling block to wider use of plastics pipe is still its inability to stand up when it must carry manufactured gas. Whether or not the makers of the raw plastics materials can ever overcome this is still problematical. It's extremely doubtful if anyone really knows now.

Yet, this isn't as big a roadblock today as it has been in past years. Manufactured gas plants are fast disappearing. They'll be out of the picture soon in Florida. And, in those areas where peak shaving is a necessity during cold weather, LP-air plants are rapidly outnumbering the manufactured gas facilities. Probably this trend away from manufactured gas will make for more plastics pipe applications, rather than the development of a material that will withstand manufactured gas.

On the brighter side of the picture, it appears that finally the gas industry will seek to set up some specifications for plastics pipe. A meeting was held late last year in Cleveland, under the auspices of AGA's operating section, to do some exploratory work on the possibility of setting up some sort of permanent plastics pipe sub-committee. These preliminary committeemen (representing Consolidated Natural Gas Co., Peoples Gas Light & Coke Co., Public Service Co. of Colorado and Southern California Gas Co.) are examining the need for some permanent committee. Something may be forthcoming soon. ■

Use of plastics pipe in a rural distribution system

Western Gas Service Co., formerly Lea County Gas Co., serves 40,000 customers in Texas, Oklahoma, and New Mexico. The company has been actively building up its summer sales through the promotion of natural gas for irrigation pumping in the irrigated farming area it serves. There are 300 irrigation wells in the Deming (Luna county) area of New Mexico. This area spreads over 180 square miles, with 21,000 acres in cultivation.

By JAMES V. KING, General Superintendent
Western Gas Service Co., Ysleta, Texas

FOR a number of years the farmers in the Deming (Luna county), area of New Mexico had been looking for a cheaper fuel to pump with. Western Gas Service Co. had made feasibility studies to construct a distribution system to serve them. Until the recent advent of plastics pipe, the project was deemed unfeasible because of the excessive footage of mains required to serve the widely dispersed farms and the high cost of steel pipe. The farmers would participate in the project only to the extent of constructing their services from the property line to their wells and standing the cost of converting from electricity to gas. The wells in the area are small, from 4-in. to 8-in., with horsepower ranging from 20 to 50. Consequently the farmers' conversion cost had to be kept to a minimum to offer sufficient inducement to make the switch in power.

The company had been studying the use of plastics pipe by Southern California Gas Co., the Tucson Gas, Electric Light & Power Co., and by farmers in the Texas Panhandle. It was finally agreed that these pioneers had sufficient experience with plastics pipe to warrant its use in the Deming area.

It was decided that, because of its wide use in the Panhandle, pipe extruded from Kralastic material would be used. The findings and recommendations of the AGA subcommittee on plastics pipe standards were studied and closely followed. The subcommittee does not recommend the use of plastics where gas contains aromatic hydrocarbons. Western Gas Service Co.'s supplier of gas assured that aromatics were not present.

We had to obtain an order from the New Mexico Public Service Commission which would allow the use of plastics pipe in a rural distribution system. The order states, in part, as follows:

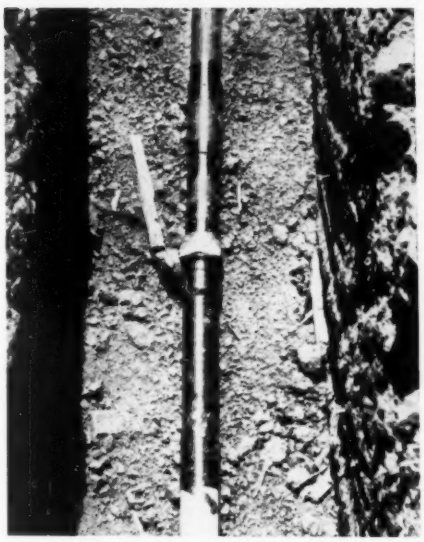
"From the evidence submitted, the Commission does not believe that it would be justified in refusing

Photos at left and below show pipe coupling and stringing method. Man at rear of pipe trailer makes up cemented joint, driver in jeep moves forward 30 ft, the length of joint. Pipe is pulled from trailer and process is repeated. A mile of pipe can be joined and strung in 2½ hr.

to grant Petitioner a Certificate of Convenience and Necessity merely because Petitioner proposes to pioneer so extensively in the use of a new material. Rather, the Commission believes that the use of this new material is the only means of supplying natural gas service to a great number of customers to whom such service would otherwise be economically unfeasible." The commission requires the company to submit a detailed report concerning all aspects of the operation and maintenance of the plastics system every six months.

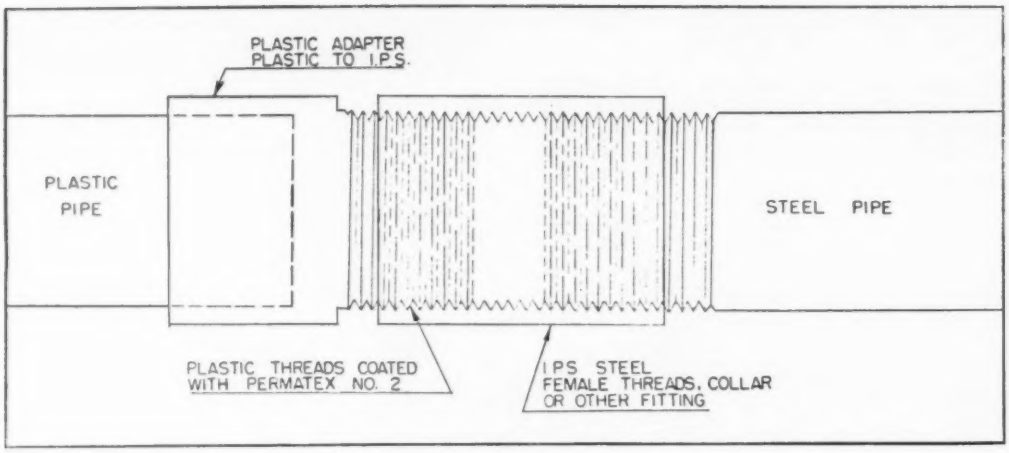
Plastics pipe definitely has its pressure limitations, and the distribution system was designed using a backbone of steel mains from which emanated the 2-in. plastics mains which were in turn looped back into the steel main again. Distribution regulators were placed at each juncture of the plastic with steel so that a maximum feed into the plastics system could be obtained. The maximum pressure limits set for the plastics mains is 50 psi, although the manufacturer's recommended working pressure at ground temperature is in excess of 80 psi. The steel main pressure is designed for 150 psi, although higher pressure could be used if necessary. Adequate pop-offs set at 60 psi are set at each distribution regulator to insure against over-pressuring of the plastics mains.

The State of New Mexico, in 1955, authorized the use of certain plastics pipe to bring gas on private property for use as fuel for irrigation well engines. These lines are subject to the inspection of the New Mexico Plumbing Administration Board through its local State Plumbing Inspectors. In conjunction with the company's plastics project, the contractor constructed over 150,000 ft of 1-in. plastic service pipe, 1.125-in. OD, 0.090-in. wall, as private piping to irrigation wells from meter sets at the property line.



Above: 2⅜-in. steel to plastic.

Below: 2⅜-in. to 1¼-in. tee.



Plastic to steel connection.

Where these private plastics lines emanate from the company's steel mains in the system, the company provides pop-off protection at the meter location so that pressures will not build up in excess of 35 psi.

There are a number of good plastics pipe contractors in the Texas Panhandle who have had a great deal of experience in laying plastics pipe to irrigation wells in that area. These contractors were invited to bid on the Deming job. A contract was drawn which specified the requirements as set forth in the commission's order, and incorporating company and manufacturer's specifications. Some of the requirements were as follows:

● Requirements

1. Contractor to furnish and install all plastics pipe and fittings; plastics pipe and fittings to be extruded from virgin Kralastic material made by Naugatuck Chemical Co. The 2-in. plastics pipe to be 2.375-in. OD, 0.090-in. wall; the ¼-in. plastics pipe to be 1.660-in. OD with 0.090-in. wall.

2. All fittings, except going from plastic to steel, to be solvent weld type.

3. Contractor guaranteed the job to be free from defects caused by poor workmanship or poor installation methods or defective materials for a period of two years from completion of work. Such defects, should they occur within the two-year period, to be promptly corrected by replacing with like materials as specified by the contractor at no cost to the company for labor and materials.

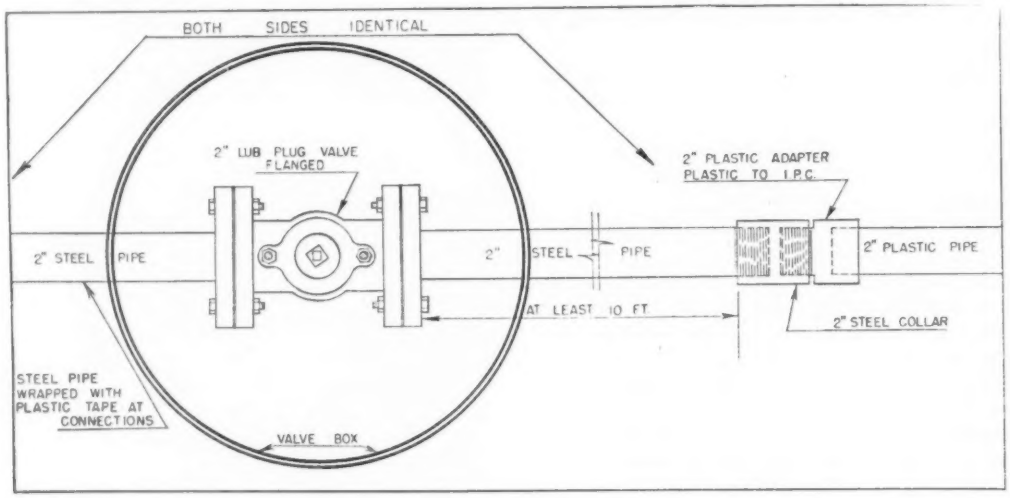
4. Contractor to furnish performance, payment, and maintenance bond to cover the total cost of labor and materials of the plastics project for the two-year guarantee period.

5. Testing: Aboveground test to be conducted in increments of approximately one mile, or less, but not to exceed 7000 ft in steps as follows:

Testing shall be done with air.

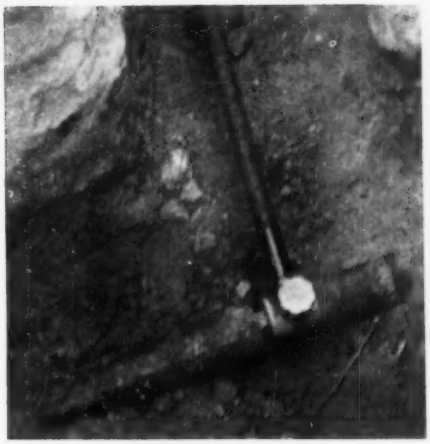
Step 1. Pressure to a minimum of 25 lb and soap each joint for leaks.

Step 2. Pressure to 125 lb at 73.4 deg. F, or equiva-



Steel plug valve to plastic pipe.

Mueller plastic valve tee installations.



lent, for one-half to two hours. (This step is designed to discover poorly cemented joints and/or pipe damaged in handling or shipping.)

Step 3. Reduce pressure to 85 lb at 73.4 deg. F, or equivalent, and hold for 12 to 24 hours. This step should reveal marginal pipe or workmanship of installation.

Below-ground test to be conducted as follows:

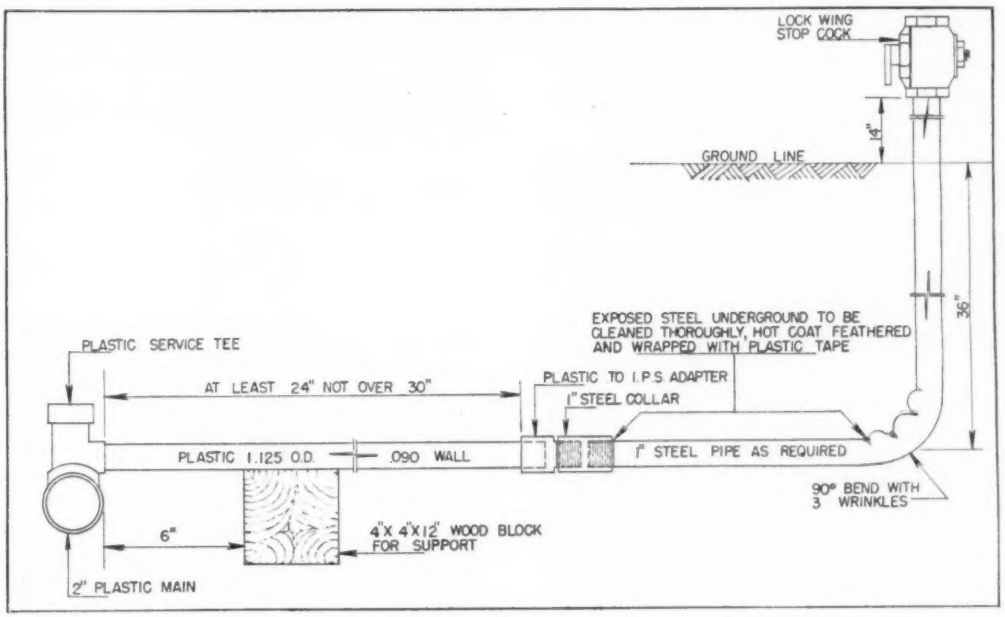
Step 1. Pipe shall be pressured to a minimum of 25 lb during backfilling.

Step 2. Line to be subjected to and pass a 100-lb shut-in pressure test for a 24-hr period.

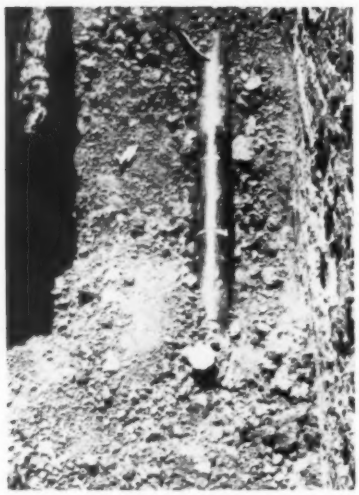
Any defects found in these tests will be repaired in accordance with standard practices and with approval of company's inspector. Contractor will furnish all labor and materials necessary to make repairs.

There are a number of good plastics pipe extruders in business who have furnished, in the past eight years, practically all of the 8000 miles of Kralastic pipe laid in the Texas Panhandle and elsewhere. The company was not too particular which extruding company furnished the pipe, as long as it was a well-established firm, its raw material and specifications lived up to the contract, and it was willing to stand behind the two-year guarantee which the contractor obligated himself to make. The company felt that by obligating the contractor to furnish both the labor and material, and making him guarantee both, then the necessity of dealing with two concerns, in the event of failure, was eliminated. Further, most plastics pipe extruders, in the event of failure, guarantee only the material, not the labor for replacement.

There were six contractors who bid the job, most of whom could have qualified. The Henderson Plumbing & Ditching Co. of Stratford, Texas, was awarded the job. Plastics pipe and fittings were furnished by the Carlon Co. of Cleveland, Ohio. The project was started in February 1958 and plastics main installation was completed in April.


LOCK WING STOP COCK
14"
GROUND LINE
36"
EXPOSED STEEL UNDERGROUND TO BE CLEANED THOROUGHLY, HOT COAT FEATHERED AND WRAPPED WITH PLASTIC TAPE
PLASTIC SERVICE TEE
AT LEAST 24" NOT OVER 30"
PLASTIC TO I.P.S ADAPTER
1" STEEL COLLAR
PLASTIC 1.125 O.D.
.090 WALL
1" STEEL PIPE AS REQUIRED
90° BEND WITH 3 WRINKLES
6"
4"X 4"X 12" WOOD BLOCK FOR SUPPORT
2" PLASTIC MAIN

Plastic to steel service stub.



Before and after shots of 2⅜-in. plastic to plastic tie-in without taking main out of service. In the top photo, pipe is cut to desired length and collar cemented on. Cap on main with pressure in it is then cut off, pipe raised, cement applied, and slipped into collar. Cement adheres so quickly that no leaks developed.

Typical regulator installation steel main to plastic main.

Mueller plastic valve tees were used for tapping 2⅜-in. and 1¼-in. plastics mains for service stubs. This method of tapping plastics mains was pioneered by C. H. Webber, retired vice president of Tucson Gas, Electric Light & Power Co., and proved very successful.

The approximate prices charged by the contractor were as follows:

	Per foot
2-⅜-in. plastics main, ditching, material and labor, per contract	$ .41
1¼-in. plastics main, ditching, material and labor, per contract	.32
1-in. plastics service stubs, per contract	.26

Footages installed were:

2-⅜-in. plastics main	217,003 ft
1¼-in. plastics main	53,259 ft
1-in. plastics service stubs	1,480 ft

Failures occurring during testing were:

Number of failures: 4.

Description: Plastics elbows pulled loose from pipe. This was caused by not allowing sufficient time for cement to cure. Elbows were slightly oversize necessitating the application of an excessive amount of cement, which required more time to cure. Manufacturer is now supplying elbows of correct size.

Number of failures: 9.

Description: Thread leaks in steel-to-plastics adaptors. These bubble leaks occurred upon application of 100-psi test pressure. Adaptors were cut out and replaced. This seems to be the only weak point in the use of plastics. A better method needs to be devised to go from plastics to steel. Plastics flanges are made to match standard steel flanges but are too flexible to warrant extensive use. The company is now experimenting in conjunction with Carlon in making a heavier plastics flange reinforced with a steel ring which should answer the problem.

Number of failures: 2.

Description: Leaks around Mueller plastics valve tees where saddle was cemented to main. There were 74 of these saddles installed. The two that failed were cut out and replaced. Leaks were caused by dirt entrained with the cement when it was applied. It is felt that the use of the Mueller tees for tapping new services is very successful. The first one installed was subjected to 100 psi and tapped out, then struck several blows laterally with a hammer and did not fail.

Number of failures: 1.

Description: Break at 1-in. steel-to-plastics adaptor at juncture of plastics service pipe to steel service riser. This occurred when heavy back-filling machine was run in ditch. Service was not properly backfilled and tamped.

There were several bubble leaks at plastics collars which were found with soap bubble test with pressure applied. These were cut out and replaced. Leaks were all caused by improper cementing methods, in that joint was not clean when cement was applied.

No plastic pipe was ruptured by pressure applied during tests. To date there is no leakage indicated in the system. ■

Service renewal by plastics insertion

By JAMES L. HIGDAY, Superintendent of Gas Operations
Kansas Power & Light Co., Salina, Kan.

KANSAS POWER & LIGHT CO. is a combination natural gas and electric utility operating entirely within the state of Kansas. Our service area covers approximately 60 per cent of the state. To serve our customers we purchase the gas at the wellhead. And it is ultimately delivered through our facilities to the customer's meter.

To serve approximately 95,000 meters in 111 communities requires the operation of 10 compressor stations totaling 32,290 hp, 260 miles of gathering lines, 1550 miles of transmission lines, and 1350 miles of distribution mains. Pipe sizes range from 1¼-in. to 22-in.

Rising unit costs and the increasing number of services being replaced were the major factors which prompted us to examine the feasibility of plastic insertion. Since we had standardized on 1.25-in. services many years ago, utilizing plastic pipe by insertion appeared to lend itself well to our operation.

To determine what type of plastics we should use in our operation, we studied the polyvinyl chloride (PVC) and the butyrate plastic pipe. PVC is generally manufactured in 20-ft lengths and requires special fittings which must be solvent welded thoroughly. One advantage it has over butyrate is that it seems to retain a more appreciable degree of toughness from rough handling during transportation and installation. Also, it appeared to have a slight edge in temperature resistance.

While both types of plastics were readily adaptable for natural gas use, we chose Tenite II, which is a plasticized butyrate. This plastic is produced by the Tennessee Eastman Co., is extruded by Western Plastics Corp. (Hastings, Neb.), and is transparent. We use Tenite II, #435, medium hard flow, 1.050-in. OD, .870-in. ID, with tolerances of plus or minus .005. We felt this plastics pipe offered distinct installation advantages since it was flexible and comes in continuous coils of about 400 ft. Also, it allowed a service replacement to be one continuous piece of pipe and would not require a solvent welded joint. This eliminated the possibility for human error in making the welds along with a resulting leak.

Renewal of services by plastic insertion began on an experimental basis in the Leavenworth division early in 1956, at which time procedures were developed and operating difficulties resolved. Records were maintained to enable us to compare the cost of replacement by plastic insertion with the replacement cost of steel. We found that on services 70 ft or

HOUSE METER SET

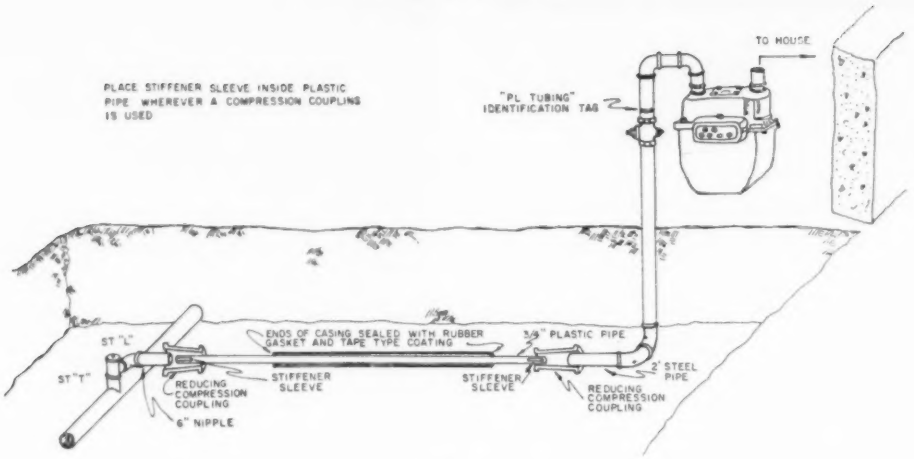


Fig. 1.

longer, we could save approximately 40 per cent in total unit cost. Examination of the data tabulated in *Table 1* illustrates the savings. It will be noted that a considerable savings is effected in the cost of labor and pipe while fittings for plastic insertion are somewhat higher. The majority of these service renewals were connected to mains located under paving. We are utilizing plastics pipe on distribution pressure up to 30 psig.

● Equipment

The tools and equipment required for plastic insertion are: air motor with reamers and blades, 100 ft of $^3/_4$-in. ID flexible steel hose, hose couplings, air line oiler, rubber blankets, hose reel, and associated minor equipment. This represents an investment of approximately $225. In our case used rubber blankets are available from our electric department.

Other necessary equipment and tools are: 80-cfm portable air compressor, four-wheel pipe cutter, straight flute pipe reamer, wrenches, hacksaw and torch. This equipment was already available as it is used in our day-to-day operation.

● Storage and Handling

Plastics tubing should be stored in moderate temperatures, and should be stacked no more than six coils high. Reduced temperatures tend to stiffen the tubing and make it difficult to handle. High temperatures tend to soften the plastic and distort the circumference. Prior to insertion of the tubing, sufficient loops are released from the main coil to complete the service. The balance of the coil is tied or taped together for easier handling.

● Safety

Descriptions about work methods are not complete without mention of safety, and a good rule to follow

ALLEY OR EASEMENT METER SET

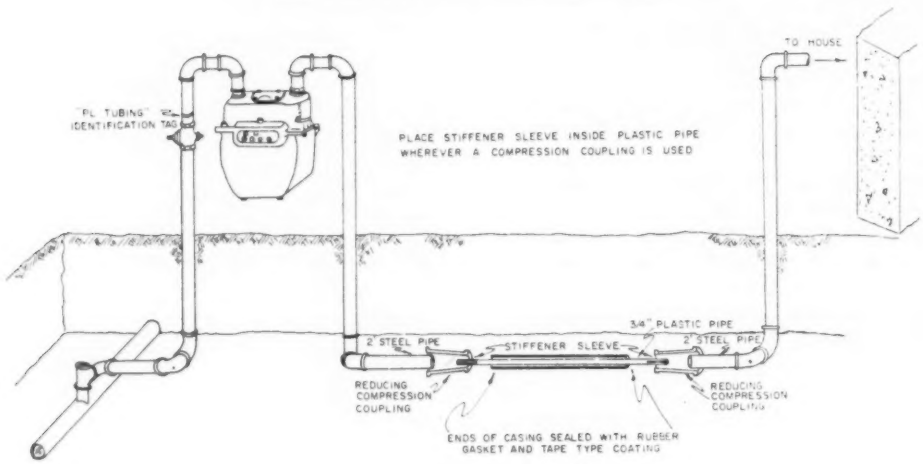

TO HOUSE
"PL TUBING" IDENTIFICATION TAG
PLACE STIFFENER SLEEVE INSIDE PLASTIC PIPE WHEREVER A COMPRESSION COUPLING IS USED
3/4" PLASTIC PIPE
2" STEEL PIPE
STIFFENER SLEEVE
2" STEEL PIPE
REDUCING COMPRESSION COUPLING
REDUCING COMPRESSION COUPLING
ENDS OF CASING SEALED WITH RUBBER GASKET AND TAPE TYPE COATING

Fig. 2.

is to mention "safety" first. Reamers rotate at reasonable high speeds and should never be operated outside the pipe. Personnel should be instructed to stay away from the ends of the pipe as dirt and scale is blown out at very high velocities. Normal precautions around compressed air equipment should be observed: wear goggles, no horseplay. Backup wrenches are absolutely necessary when making the connections and changing meters on plastics service installations.

● Method of Insertion

Our method of insertion is based on the renewal of all fittings and service pipe beneath the ground.

Excavations are made at the main and at the building. The service is cut approximately 1 ft from the main and the service tap fittings are renewed. Also, the service is cut approximately 30 in. from the meter riser.

Both ends of the old service pipe are hand reamed until the burrs are removed. The air-driven reamer is then inserted into the old pipe, and is advanced and withdrawn in short thrusts to clean the inside of the pipe. To keep the inside of the plastics tubing clean and for easier installation, a home-made expander plug is placed in the end of the tubing prior to inserting it into the old pipe. To protect the plastics tubing, rubber blankets are placed on the sides of the excavation. As the tubing is inserted, it is examined for defects and damage.

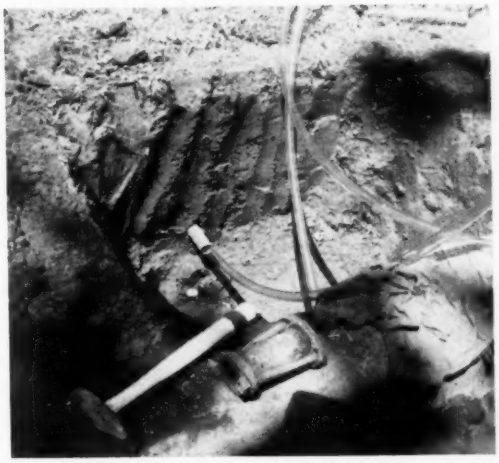
After insertion of the tubing, a copper sleeve is inserted into the end of the tubing to provide rigidity in making the plastic to steel connection and to assure retention of pipe form. The fittings on the meter riser are renewed. At least 24 in. of horizontal pipe is installed at the riser elbow to provide firm support for the meter. A compression coupling is installed on the end of the horizontal pipe. The tubing is inserted into the coupling until only ½ in. of the copper sleeve is visible. Back-up wrenches are used when tightening the connection.

Pressure test equipment is installed on the tubing at the main and the service is air tested at 30 psig. The tubing is then connected to the service tap fittings in the same manner as the connection is made to the meter riser.

When all connections are tight, the new service

TABLE I. COMPARATIVE COST OF SERVICE RENEWALS, 1956-1957

	Steel	*Plastics*	*Savings-plastics over steel*
Number of service installations	176	257	—
Average length, ft	69	68	—
Manhours per installation	36	21	15
Labor, per installation	$68.40	$37.60	$30.80
Pipe or tubing, per installation	$21.39	$10.20	$11.19
Fittings, per installation	$ 4.81	$ 7.32	$ 2.51-
Equipment and other, per installation	$16.60	$12.70	$ 3.90
Total Cost, per installation	$111.20	$67.82	$43.38
Cost per ft	$ 1.63	$ 1.00	$ .63



TOP TO BOTTOM

Pressure testing plastic service.

Layout of plastics insertion equipment on the job.

Using back-up wrench to protect plastics.

line is purged. Soap suds are used for the final leakage test.

Split gaskets are installed at the ends of the old service pipe to act as bushings for the plastic. This provides protection against possible abrasion. All fittings are wrapped with coating tape.

A tag identifying the service as plastic is installed above the meter cock.

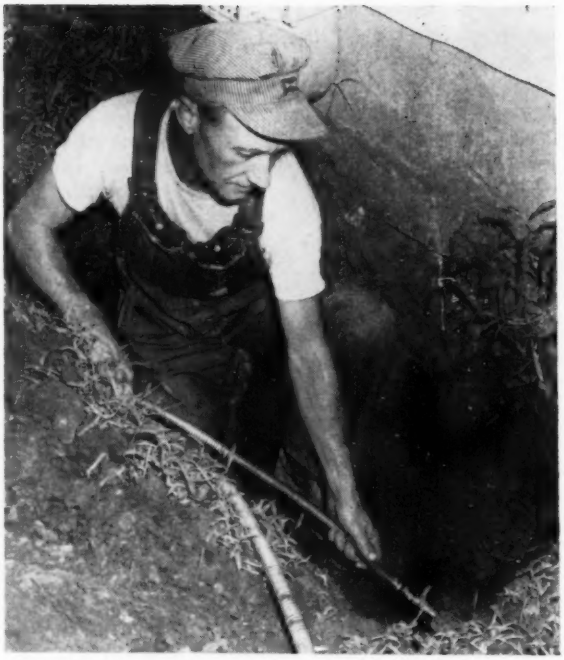
Finally, service is restored and the excavations are filled and tamped.

● Employee Training

The installation of plastics is a simple operation, but certain techniques must be developed, and it was our desire that personnel involved in this type of work be properly instructed. Training schools were held in each of our divisions for our gas distribution personnel. About three hours are spent in classroom reviewing the why and wherefores of using the plastics tubing and demonstrating the installation techniques by a mock display. The personnel are then taken into the field to witness and actually make a few installations. In addition to the school, a training bulletin has been prepared and is issued to each employee.

● Summary

We feel our program of renewing old services by inserting plastics pipe has been highly successful. Along with the economical savings mentioned, our personnel have indicated a great deal of enthusiasm in this type of construction. Certainly we have reduced our future corrosion potential substantially. It has proved to be an invaluable aid in our public relations as we are now replacing services with a minimum of damage to customers' lawns and other property. The value of plastics insertion is priceless in this respect. We believe the greatest initial savings offered by plastics pipe is through its use for service replacement by insertion. At present we have not studied nor do we have any experience with using plastics pipe for direct burial. ■



Cleaning pipe with air-driven reamer.

Insertion of Plastics from the Distribution Main Excavation.

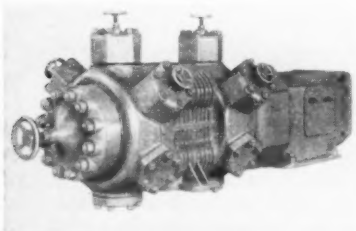
GAS DIGEST

New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 89, 90

1. Ductile pipe

American Cast Iron Pipe has introduced a complete line of pipe, tubing, casing, fittings and special castings made from ductile iron. A major application is for underground gas mains where high pressures, extreme beam and crushing loads, unusual shocks and stresses, unstable bedding and deep fills may be encountered. Under such adverse conditions, American ductile iron pipe actually twists and bends without breaking.
American Cast Iron Pipe Co.



2. Compressor cylinder

Extremely high efficiency, even at compression ratios as low as 1.2, is said to be possible with Clark's new pipeline compressor cylinder. The cylinder incorporates these internal design features which have a cumulative effect on improved performance: new valve design using nylon poppets for extra long life; large internal manifolds streamlined to avoid turbulence and pressure drop; oversize suction and discharge nozzles to keep velocities low.
Clark Bros. Co.

3. Power digger

The Sherman F-8 Panther power digger, Model 1128, is now available for mounting on Models 1821 and 1841 of the new Ford industrial tractor. A feature of the tractor-digger combination is the use of an independent electric fan-cooled heat exchanger that serves the hydraulic system. Neutralized are extremely hard digging, high atmospheric temperatures, and sun heat radiation.
Sherman Products Inc.

4. Gas chromatography

Podbielniak's new Chromacon incorporates the latest innovations developed through research and investigation. In order to simplify work of the analyzer, important special features are introduced. Some of these are: Interchangeability of detectors; proportional control circuit for close regulation and uniformity of column and detector temperature. A specially designed recorder is used to record essential operating data. The instrument may be operated with one or two columns in the compartment.
Podbielniak Inc.

5. Gas lamp

Charmglow is a new line of traditional gas lights. Produced by Modern Home Products, the new lights are made of solid copper or cast aluminum and are available in a variety of finishes.
Modern Home Products

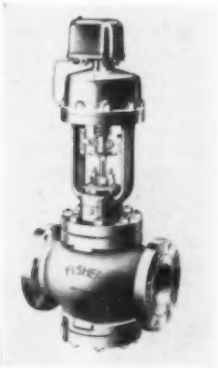
6. Field regulator

A new 2-in. high pressure field regulator just introduced completes Rockwell's line of "141" regulators: ¾-, 1-, 1¼-, 1½-, and 2-in. Rockwell's field regulators are particularly useful along isolated gas transmission lines where industrial and domestic consumers requiring small volume service must tap the lines directly. The

simple, light weight "141" regulators are especially designed to handle the primary cuts in pressure.
Rockwell Manufacturing Co.

7. Pipe cutter

H&M Pipe Cutting has improved the design of two of the attachments for its standard pipe cutting and beveling machines. The remodeled Shape Cutter is light weight and features easy, fast mounting. It will cut various shapes of pipe intersection automatically. The Out-of-Round attachment features a new, free-wheeling roller assembly that turns a full 360 degrees.
H & M Pipe Cutting



8. Piston operator

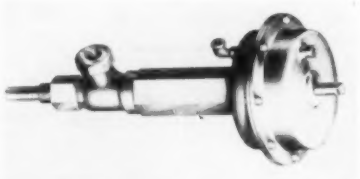
Fisher's new high pressure pneumatic piston operator was designed primarily for use where more force and higher stroking speeds are required than are available from diaphragm operators. The Type 470 P.O.P. includes an enclosed positioner mounted on the cylinder, suitable for a wide range of instrument signals. It operates on any supply pressure up to 150 psi and creates stem forces from 1500 to 12,000 lb.
Fisher Governor Co.

9. Crane excavators

Schield Bantam has completely redesigned its line of carrier-mounted, crawler-mounted, and self-propelled ⅜-yd crane excavators. Greatly increased lifting capacities and greater flexibility in its complete attachment line are featured. Major changes on the new Series 350 Bantams include a new turntable design featuring a combination hook and trunnion roller design offering fewer parts, more equal load distribution, less wear and maximum strength for the increased capacities.
Schield Bantam Co.

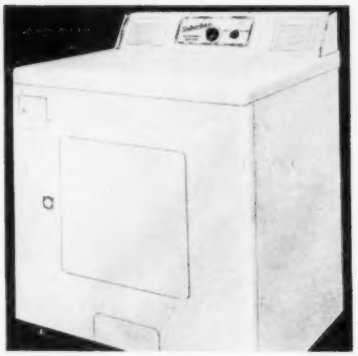
10. Built-in ranges

Cribben & Sexton has a completely new line of Universal built-in ranges. Available in the 1959 line will be 14 gas surface cooking units and five super-size oven and broiler units—all in Supreme, Custom, and Deluxe designs. All models feature Universal's "air conditioned" oven, smokeproof broiling, an "obedient burner" cooking. The air-conditioned, super-size oven has a built-in circulation control that keeps heat evenly balanced for perfect baking.
Cribben & Sexton Co.



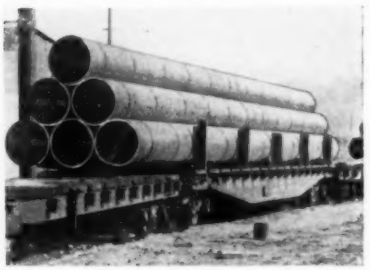
11. Dump valve

Black, Sivalls & Bryson's new high pressure dump valve is for use in the production of gas and oil. Designed for dumping liquid from pressure vessels, the valve is actuated by a displacement type liquid level controller or other piloting device capable of an air output of 6-30 psi. It is also suitable for "stop cocking," and although primarily designed for on-off service, it can be used for limited throttling range applications.
Black, Sivalls & Bryson Inc.



12. Clothes dryer

Suburban Appliance Co.'s new automatic gas clothes dryer operates on the low heat-high air volume principle. It combines a new type drum of perforated construction for maximum air movement, and a 3-in. vent for fast moisture removal—all contributing to the dryer's quiet operation.
Suburban Appliance Co.



13. High-test line pipe

Master Tank is now producing API 5LX expanded high-test line pipe in 63-ft double-jointed lengths. Master line pipe comes in 20- to 30-in. diameters.
Master Tank & Welding

TRADE LITERATURE

14. Electronic instruments

Bristol has released a new edition of its Bulletin P1245-A, "Dynamaster Electronic Instruments." Complete specifications of Bristol's potentiometer and bridge instruments in indicating, recording, and controlling models are given.
Bristol Co.

15. Data processing

Published recently was a new brochure describing the functions of Univac data processing equipment. It illustrates a broad range of basic data processing functions and shows the specific equipment to execute them. The new brochure

FOR MORE INFORMATION

about New Products in this Issue . . . . .

Each New Product or Trade Literature item reviewed in this issue is numbered. Circle the corresponding numbers on the Readers' Service Card; then PRINT your name, title, company and address plainly and drop the card in the mails (no postage is needed).

USE THESE POSTAGE FREE POST CARDS

Circle the number of the item requested

FIRST CLASS PERMIT NO. 6955 Los Angeles, Calif.

BUSINESS REPLY CARD
No postage necessary if mailed in the United States

POSTAGE WILL BE PAID BY

GAS **Magazine, Readers' Service Dept.**
198 SOUTH ALVARADO STREET
LOS ANGELES 57, CALIFORNIA

GAS READERS' SERVICE DEPARTMENT

Please send me further information about the items circled below . . . .

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49
50	51	52	53	54	55	56
57	58	59	60	61	62	63

• *Please Print*

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

CITY & STATE_____

March, 1959 • **Void after 90 days**

GAS READERS' SERVICE DEPARTMENT

Please send me further information about the items circled below . . . .

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49
50	51	52	53	54	55	56
57	58	59	60	61	62	63

• *Please Print*

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

CITY & STATE_____

March, 1959 • **Void after 90 days**

FIRST CLASS
PERMIT NO. 6955
Los Angeles, Calif.

BUSINESS REPLY CARD
No postage necessary if mailed in the United States

POSTAGE WILL BE PAID BY

GAS Magazine, Readers' Service Dept.
198 SOUTH ALVARADO STREET
LOS ANGELES 57, CALIFORNIA

FOR MORE INFORMATION

about New Products in this Issue . . . . .

Each New Product or Trade Literature item reviewed in this issue is numbered. Circle the corresponding numbers on the Readers' Service Card; then PRINT your name, title, company and address plainly and drop the card in the mails (no postage is needed).

FIRST CLASS
PERMIT NO. 6955
Los Angeles, Calif.

BUSINESS REPLY CARD
No postage necessary if mailed in the United States

POSTAGE WILL BE PAID BY

GAS Magazine, Readers' Service Dept.
198 SOUTH ALVARADO STREET
LOS ANGELES 57, CALIFORNIA

GAS READERS' SERVICE DEPARTMENT

Please send me further information about the items circled below . . . .

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49
50	51	52	53	54	55	56
57	58	59	60	61	62	63

• *Please Print*

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

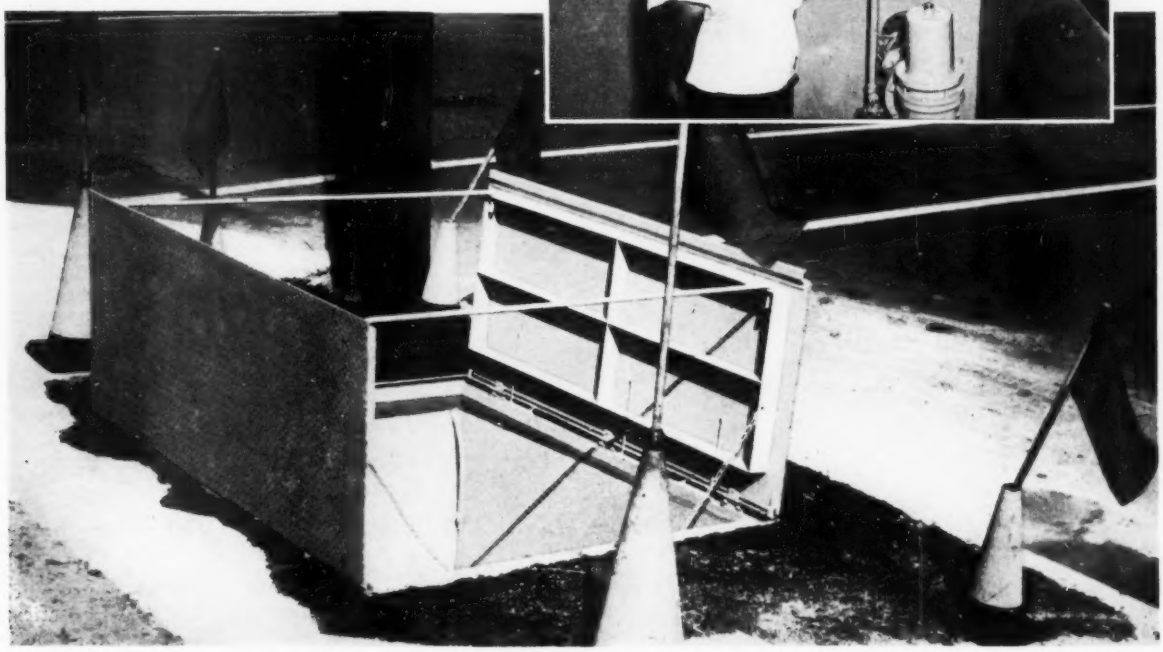
CITY & STATE_____

March, 1959 • Void after 90 days

USE THESE POSTAGE FREE POST CARDS

Circle the number of the item requested

For Trouble-Free Off-the-Road Regulator Installations



Bilco Sidewalk Doors provide a safe, easy-opening, watertight protective cover!

EVER TRY TO LIFT AN ORDINARY SIDEWALK DOOR?

Bilco sidewalk access doors have built-in lift springs for effortless one-man operation. The most outstanding improvement ever made in the manufacture of heavy plate horizontal access doors.

Because of the rising cost of street vault construction and increasing traffic hazards, gas companies in many cities are now placing their district regulator equipment in "under-the-sidewalk" locations. They're installing Bilco Sidewalk Doors — for the improved ventilation, built-in drainage features, ease of maintenance, durability and all-around safety you'll get when *you* specify Bilco!

Send coupon today for free copy of reprint from Gas Magazine, entitled:
"Standardization and Prefabrication of District Regulator Installations"

Bilco®

DOORS FOR SPECIAL SERVICES

The Bilco Co., Dept. A-193, New Haven 5, Conn.
Send folder on "Standardization & Prefabrication" ☐
Send catalog with details of Bilco Sidewalk Doors ☐

NAME .....
FIRM .....
ADDRESS .....
CITY ..... STATE .....

explains the techniques of processing unit facts.
Remington Rand Division

16. Ironcase meters

American Meter's 25B and 35B iron case meters are described in new literature. Complete details on the capacities, construction, and performance of both meters are presented.
American Meter Co.

17. Gate valves

Groves' G-3 series of cast steel pipeline gate valves is the subject of a new catalog. Dimension drawings and dimension figures for ASA Series 150, 300, 400, 600, and 900 are included.
Grove Valve & Regulator Co.

18. Pipeline control

A new control concept for pipeline systems is discussed in a four-page brochure from Union Switch & Signal. The brochure presents in detail methods of determining and providing the type of centralized control systems required to meet present and future needs of the gas industry safely, reliably and economically.
Union Switch & Signal

19. Printer system

ElectroData's new 220 high-speed printer system, which prints out copy direct from the computer or from magnetic tape at up to 1500 lines per minute, is described in a four-page brochure. Salient features of the transistorized system include automatic editing, built-in checking, simplified plugboard programming and on- or off-line operation.
ElectroData Division

20. Odorization manual

A 42-page odorization manual has been published by Natural Gas Odorizing. The loose-leaf manual is a complete treatise on odorants and their usage in the natural gas industry. Listed in the table of contents are such subjects as principles of gas odorization, soil penetration, installation and maintenance of odorizing equipment, determining odorization efficiency, and many others.
Natural Gas Odorizing

21. Technical bulletins

Four bulletins containing detailed information about American Meter Co. products and their applications are available. Bulletin 400 covers pressure recorders and elements. Recording charts and planimeters are the subject of Bulletin 407, while temperature recorders and elements are covered in Bulletin 408. The fourth bulletin, 409, describes recording orifice meters and temperature recording elements.
American Meter Co.

News about plastics pipe and corrosion prevention

22. Plastics line

Sloane's latest package of literature on plastics pipe fittings includes the company's new 1959 catalog, 1959 plastics fittings brochure, insert fittings sales sheet, and a 2-page list of IPS fittings. The catalog contains complete specifications on plastic pipe fittings and valves.
Sloane Manufacturing Co.

23. Plastics pipe

Plastic Process Co.'s new literature describes the company's line of plastics for gas lines. The company-extrudes all types of plastics, specializing in butyrate.
Plastic Process Co.

24. Coating

Seamless Rubber has a new type of system for applying polyethylene tape as a pipe coating. Seamless uses a prime coat to be applied to the pipe prior to the application of the pressure sensitive polyethylene tape. The primer can be applied by conventional methods requiring a matter of a few minutes to dry before the tape is applied.
Seamless Rubber Co.

25. Plastics piping systems

A handbook designed specifically for engineers designing plastics piping systems has been published by Chemtrol. Included in the detailed handbook are chemical resistance and physical properties charts with recommendations. Also discussed are the company's lines of ball valves for corrosion service, check valves, cock valves, and fittings.
Chemtrol

26. Pipeline protection

Three brochures are available from Plicoflex Inc. describing its lines of materials for field or yard wrapping of pipelines, making field joints and repairs on coated pipelines using cold applied materials. Also discussed are Plicoflex No. 311 and 312 tapered butyl extrusions for use in making field joints on coupled pipelines and on pipelines with coatings 3/16 to ½ in. thick.
Plicoflex Inc.

27. Plastics pipe

A four-page bulletin from Kraloy is generously illustrated with actual installation shots of plastics pipe and fittings. The speed, ease and economies of plastics pipe are covered.
Kraloy Plastic Pipe Co.

28. Plastics pipe, fittings

Lascopipe has published a specification catalog covering its line of PVC Lascopipe, Kralastic plastics pipe, and PVC fittings.
Lascopipe

29. Cathodic protection

Selenium or silicon cathodic protection rectifiers are available from Lester Equipment. A 6-page catalog describes the equipment, which features up to 74 per cent conversion efficiency with single-phase input, long life through cool operation, and easy accessibility for inspection.
Lester Equipment Manufacturing

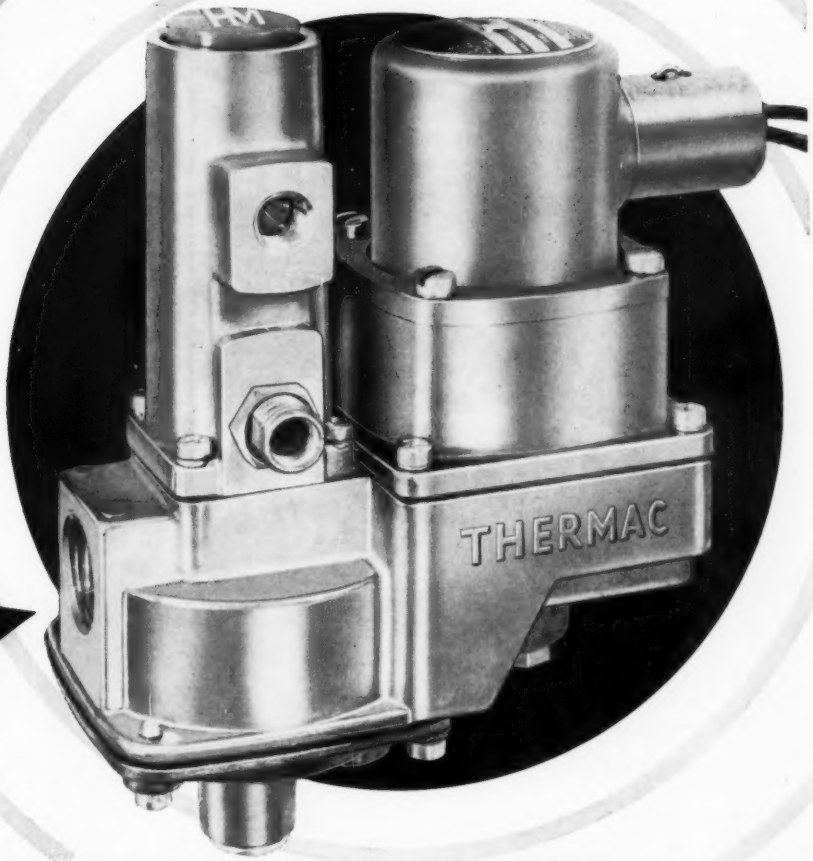
30. Moisture monitors

Consolidated's portable moisture monitors for monitoring or control of moisture in gases or gaseous mixtures are covered in detail in a new publication. The monitors feature quick response-immediate recovery, 1 to 1000 ppm and 1 to 20,000 ppm ranges, with accuracy better than 5 per cent.
Consolidated Electrodynamics.

31. Coatings

Epocast coatings, sealants, adhesives and pastes from furanes, epoxies and polyurethanes are covered in a four-page, illustrated catalog from Furane Plastics.
Furane Plastics Inc.

For the Mass Market in the Heating Field!



THERMAC Model SLS-121
Unit illustrated has
100% pilot shut off.

COMBINATION CONTROL

REGULATOR • SAFETY • AUTOMATIC MAIN GAS CONTROL VALVE

Safe Lighting With or Without 100% Shut off.

Certified by A.G.A.

In a carefully calculated design based on 25 years gas control experience, THERMAC combines in this three-in-one control every feature important to the appliance builder, the dealer, and the customer. Identical in performance and capacity to the now universally accepted SLS-100, it is ideal where space below the control is limited. The unit consists of a regulator, quiet automatic main gas valve and a 100% pilot shut off when required. A manual reset is available in conjunction with automatic main gas valve. Every component is long proven and well accepted in the gas appliance field.

Drawings, prices and samples of the SLS-120 series are now ready for manufacturers interested in reducing the over-all cost of gas control assemblies.

Write, wire or telephone for immediate action.

THERMAC
HM COMPANY
14296 East Sixth Street,
Corona, California. REdwood 7-3511

Distributed in Canada by Ontor, Limited.

GAS · DISTRIBUTION NEWS

Mich Con steps up appliance promotion

Michigan Consolidated Gas Co. is stepping up its sales promotion program for everyone connected with gas appliances in the company's service area.

Three major programs were held in 30 days to help company sales people as well as appliance dealers, department store staffs, builders and others perfect their personal sales techniques and catch up with the latest information on appliances.

Two three-day seminars were addressed by some of the nation's leading sales speakers. One seminar was held in Detroit for 500 appliance people from that area and Ann Arbor. The second was held in Grand Rapids for 200 salesmen from all over the northwestern section of Michigan. Earlier some 500 Detroit architects, builders, kitchen modernizers and their sales personnel attended Mich Con's dramatic science show, "Gasarama" and a "perfect fuel" demonstration.

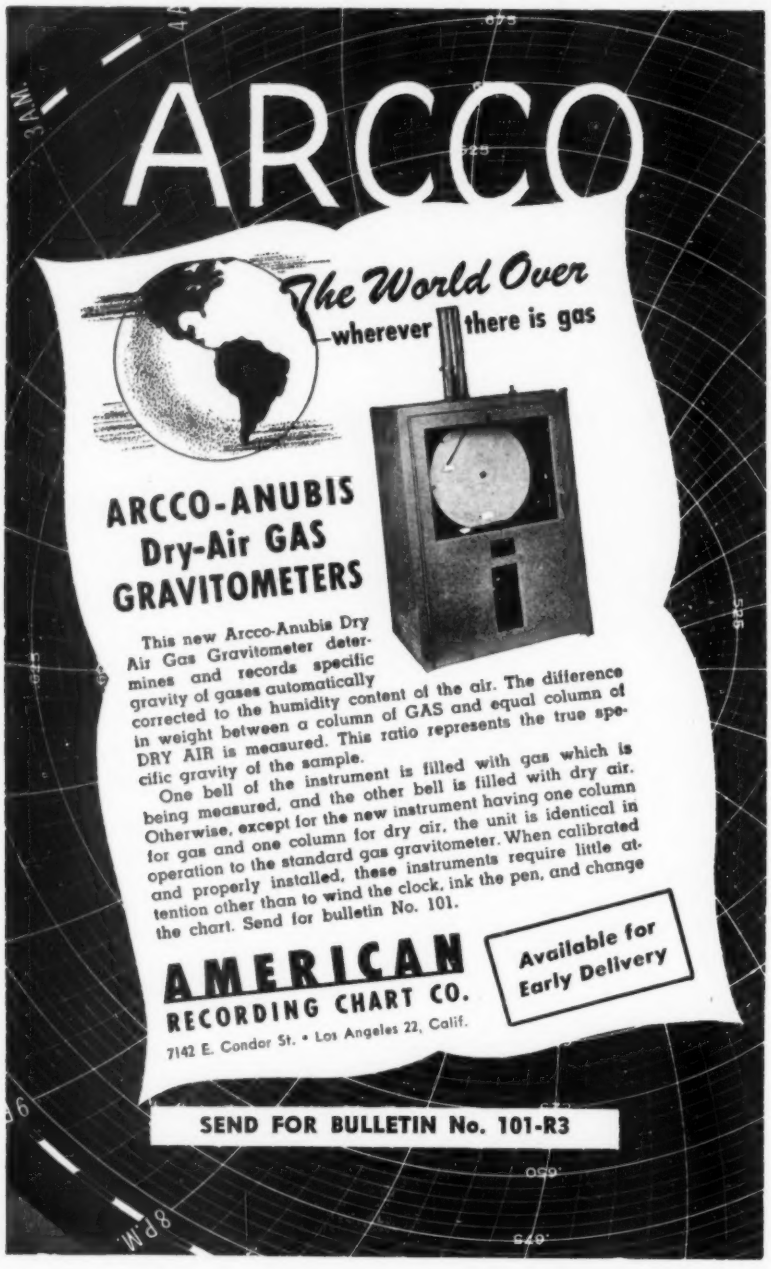
The company developed Gasarama to create interest among high school students in a scientific education. It also proved to be an effective sales tool, particularly from the standpoint of proving that the natural gas industry is research minded and always on the trail of new development. The presentation shows the role science plays in the development and uses of natural gas, its discovery, transmission and distribution.

Milton Elert, dealer sales coordinator for Michigan Consolidated, teamed showmanship with sales talk in his "perfect fuel" demonstration. He entertained with tricks and skits while putting over his message: "Everyone is a potential buyer and it is the primary purpose of these meetings to sow the seeds of creative selling among our own employees, suppliers, dealers, and appliance outlets."

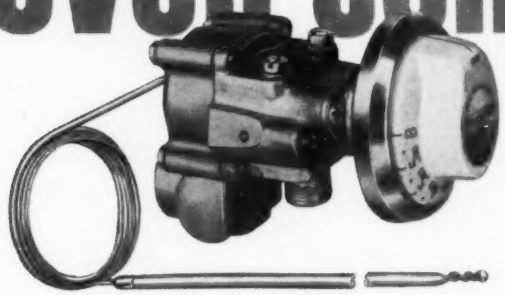
Atlanta (Ga.) Gas Light is insulating its refrigerated propane storage tanks with cellular glass insulation from Pittsburgh Corning Corp. Tank shown here has been enclosed by free-standing cylinder of Foamglas insulation. Two layers of blocks were used for the walls with a total thickness of 7 in.

CIG sells 110-mile line to Citizens Utilities

Citizens Utilities Co., Stamford, Conn., is buying from Colorado Interstate Gas Co. some 110.9 miles of gas transmission line in southeastern Colorado.


ARCCO
The World Over
wherever there is gas
ARCCO-ANUBIS
Dry-Air GAS
GRAVITOMETERS
This new Arcco-Anubis Dry Air Gas Gravitometer determines and records specific gravity of gases automatically corrected to the humidity content of the air. The difference in weight between a column of GAS and equal column of DRY AIR is measured. This ratio represents the true specific gravity of the sample.
One bell of the instrument is filled with gas which is being measured, and the other bell is filled with dry air. Otherwise, except for the new instrument having one column for gas and one column for dry air, the unit is identical in operation to the standard gas gravitometer. When calibrated and properly installed, these instruments require little attention other than to wind the clock, ink the pen, and change the chart. Send for bulletin No. 101.
AMERICAN
RECORDING CHART CO.
7142 E. Condor St. • Los Angeles 22, Calif.
Available for Early Delivery
SEND FOR BULLETIN No. 101-R3

NEW WILCOLATOR gas oven control



Wilcolator Model XC
High-Capacity Gas Valve
and Oven Thermostat
(also available with pilot
connection as Model X)

Temperature range:
200-550°F, plus broil

AGA rating, Btu/hr:
Manufactured gas—49,000
Natural gas—72,500
LP gas—154,400

FOR RANGES WITH AUTOMATIC IGNITION

Simplifies manifold design • Saves assembly time

The new Wilcolator Model XC Oven Control is 40% smaller than previous models. It helps you design more compact manifolds, such as those required on sloping front valve panels. It also simplifies outlet hook-up, because the outlet casting can be positioned four different ways. No special fittings are needed.

Model XC is designed for fast installation. The gasket is already bonded to the flange plate. Flange bolts and lockwashers come preassembled. Dial and bezel snap in place. This not only saves time and labor on the assembly line, but also means fewer parts for inventory.

The XC control is calibrated by a new automatic method that eliminates any possibility of human error and virtually eliminates all need for field calibration. Write for further information.

Thermostats for Every Heating and Cooling Application

THE Wilcolator COMPANY

THE WILCOLATOR COMPANY
1001 NEWARK AVE., ELIZABETH, N.J.
In Canada: Wilcolator (Canada) Ltd., 221 Evans Ave., Toronto 14, Ont.
Export: Wilcolator, 1010 Shaff Bldg., 1505 Race St.
Philadelphia 2, Pa.

With these 3 RIDGID®
Jam-Proof Pipe Threaders
my power drive threading is
Safe—no watching to keep them
from jamming...save me a lot of time, too!

1" to 2" Pipe
RIDGID
65R-TC

Jam-proof—can't jam if you forget it . . . Threads 4 sizes of pipe and conduit with 1 set of dies . . . True-Centering workholder—no more crooked threads—but adjustable for drip threads. Far more for your money—compare!

2½" to 4" Pipe
RIDGID 4PJ

Jam-proof . . . drive pinion kicks out automatically—real safety when power threading. Workholder sets to size before putting on pipe. Other exclusive advantages. Special 4PJ for conduit.

4" to 6" Pipe
RIDGID 161

Jam-proof for safe power threading. 1 set of dies threads 4", 4½", 5" and 6" pipe and conduit—sets to size fast. Workholder sets to size before putting on pipe, a work-saver feature. Many other reasons why the 161 is your best buy!

See and try these popular RIDGID Threaders...at your Supply House.

The Ridge Tool Company Elyria, Ohio, U.S.A.

THREADED PIPE...It's Tight...It's Best...Costs Less!

Citizens has distributed natural gas in this area for many years, serving the communities of La Junta, Rocky Ford, Swink, Ordway, Fowler, Manzonola, Las Animas, Ft. Lyon, Crowley, Olney Springs, and Sugar City.

Under the agreement with CIG, Citizens will continue to serve all gas customers now served by the pipeline. It also will be able to expand its operations in areas in the Arkansas valley which do not now have gas service. Over-all economics of operation will result because of the elimination of duplicating operating and maintenance crews now maintained by both companies. Citizens will take over and provide all transmission pipeline functions after transfer of the facilities.

Gold Star ranges launched in Chicago

More gas range manufacturers, offering more new product developments than in any previous year, marked the launching of the "Gold Star Year" at the opening of Chicago's Merchandise and Furniture Mart.

The industry's recently adopted Gold Star range program is assured of $30 million worth of promotional support.

Every manufacturer will produce a completely "matchless" range, said John P. Wright, president of Geo. D. Roper Corp. and chairman of GAMA's domestic range division. The 1959 ranges, as a "class," he added, will account for "literally hundreds of functional, convenience, and cooking-insurance improvements over past models."

Highlights of gas ranges now showing at the marts or slated for appearance soon include:

A "Microray" gas broiler that generates 1600-degree temperature on ignition and a 3-micron wave length of infra-red energy that travels to the food as straight as light, cooking and browning it on contact, eliminating preheating and cutting cooking time in half.

The "Grillevator," a pushbutton power elevator that raises or lowers the gas broiler grill to the desired height.

Floor guides, installed in corners of range to make it easy to move without marking floors or linoleum, or to adjust a range corner on a floor that is not level.

Titanium-added porcelain to give ranges a lasting, chip-proof surface.

Also, one-piece "uni-burners,"

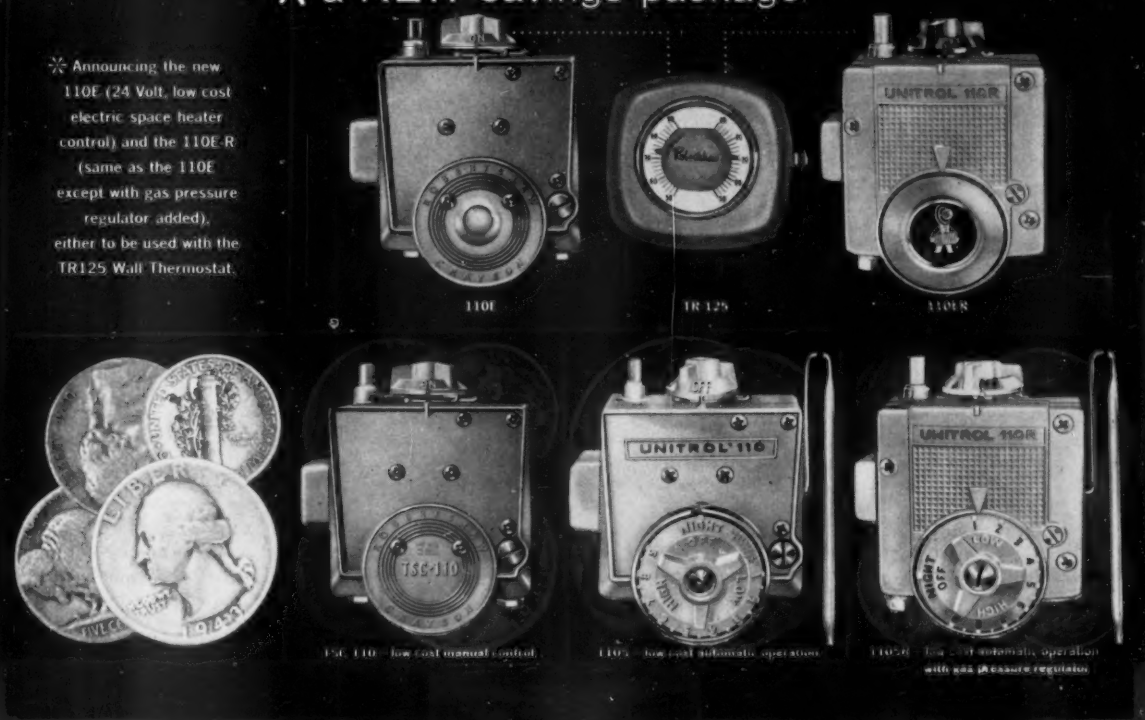
...when you specify

ROBERTSHAW

your savings show up here

✳ a NEW savings package

✳ Announcing the new 110E (24 Volt, low cost electric space heater control) and the 110E-R (same as the 110E except with gas pressure regulator added), either to be used with the TR125 Wall Thermostat.



TSC 110 - low cost manual control

110S - low cost automatic operation

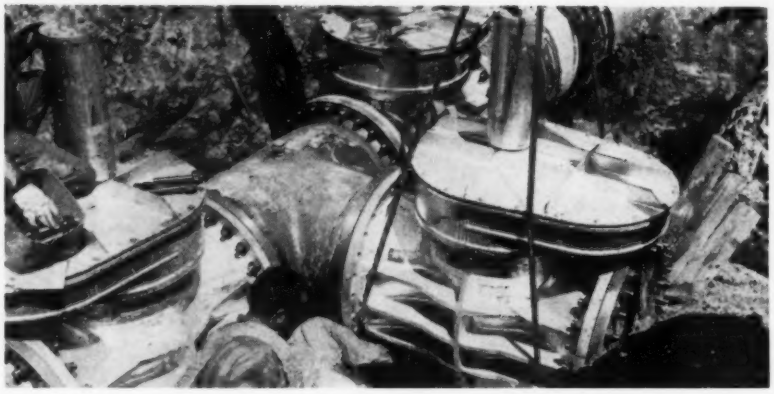
110SR - low cost automatic operation with gas pressure regulator

...a complete selection of reliable low-cost space heater controls

Robertshaw-Fulton

CONTROLS COMPANY

CONTROLS DIVISION - LONG BEACH, CALIFORNIA



Northern Illinois Gas continues $141 million construction program as workmen install three 30-in. Rockwell-Nordstrom valves on a new 2500-ft main segment. Two valves already in place will control flow in both directions of the feeder line. Valve being bolted into a t-intersection controls the distribution line. Valves are gear-operated and have water-tight housing to eliminate need for placing valves in vaults.

micro-jet ignition, air conditioned ovens, foldaway top burners, two- and four-burner drop-in tops, aluminum lining for oven walls and doors, broiler pans that drain fats to a lower-level pan, thermal griddles, swinging door with magnetic door catch, top-of-range rotisserie with thermo spit, an oven rotisserie kit, a roto-roaster, silicon door seals, non-tilt oven racks, and many others.

Members of GAMA's gas range division whose wares were on display in Chicago include Brown Stove Works, Caloric Appliance Corp., Cribben & Sexton Co., Crown Stove Works, Dixie Products Inc., Hardwick Stove Co., Magic Chef Inc., Norge Sales Corp., O'Keefe & Merritt Co., Geo. D. Roper Corp., Wedgewood - Holly Appliance Co., and Welbilt Corp.

Others include Sunray Stove Co., Athens Stove Works Inc., Tappan Co., and Whirlpool Corp.

U. S. homemakers using 102 million gas appliances

More than 102 million gas appliances are in daily service in U. S. homes. In a new analysis of the residential market, the AGA reports that nearly 3.5 million were added last year.

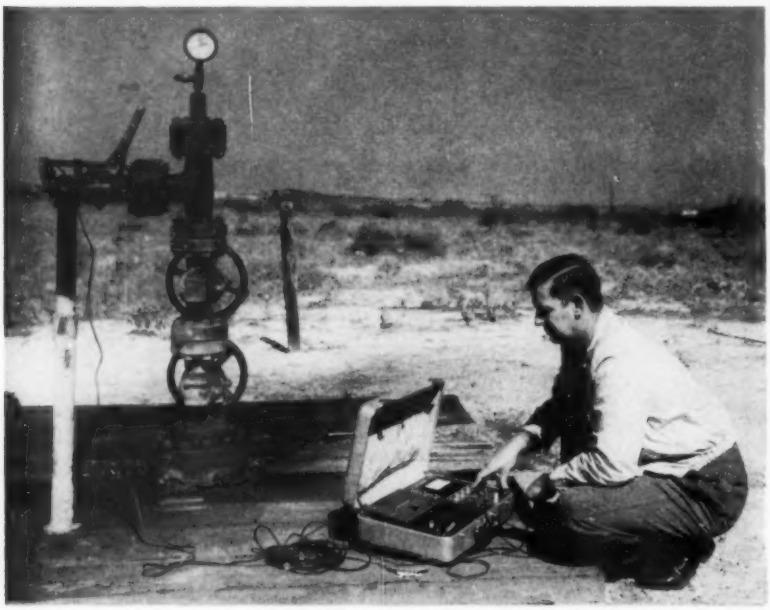
These appliances are used by about 38 million residential gas customers, including nearly 29 million served by utilities and about 9 million who use L.P. gas.

Accounting for the largest portion of gas-fueled equipment currently in use are nearly 40 million heating units. Included in this total are 10.5 million central heating systems, 23,140,000 space heaters, and 6,230,000 floor and wall furnaces.

Homemakers in 48 states and the District of Columbia are using 32,975,000 gas ranges, 23.1 million water heaters; 3,430,000 refrigerators, and 2,250,000 dryers. Gas incinerators in service total about 465,000 The modern gas light accounted for an estimated 250,000 sales in 1958.

Public utility financing set new high in '58

Financings by the nation's privately owned public utilities set a



A Cathodic Protection Service engineer using CPS instruments is running a Current-Potential curve on one of 115 well casings in West Texas to obtain essential cathodic protection design data. These instruments were developed through extensive field experience and research.

FACED WITH SERIOUS EXTERNAL casing corrosion, the West Texas operator of these 115 wells selected Cathodic Protection Service to design and install the most economical protective system consistent with quality materials and workmanship . . . *ALL ON NEGOTIATED BASIS.*

Well casing protection is just one area of this specialized engineering field in which owners and operators have come to realize that competitive bidding involving engineering judgment, know-how and integrity can become a frustrating and expensive experience.

Cathodic Protection Service offers something that can neither be standardized nor specified!

Cable Address — CATPROSERV

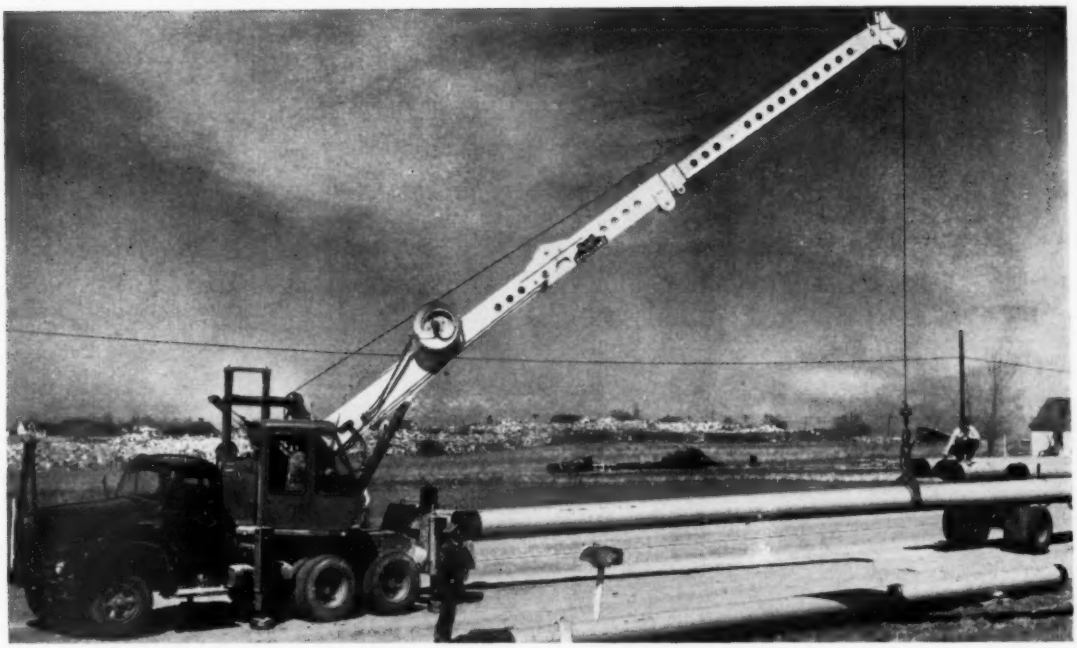
CPS **cathodic protection service**

P. O. Box 6387 Houston 6, Texas JAckson 2-5171

CORPUS CHRISTI 1620 South Brownlee TUlip 3-7264
DENVER (Golden) P.O. Box 291 CRestview 9-2215
NEW ORLEANS 1627 Felicity JAckson 2-7316
ODESSA 5425 Andrews Hwy. EMerson 6-6731
TULSA 4407 S. Peoria Riverside 2-7393

Q Why do so MANY forward-thinking utilities buy hydrocranes?

A ONE BIG REASON IS ALL-HYDRAULIC CONTROL



The 12-ton Hydrocrane's precision control is unbeatable when you are setting pipe, working in close quarters, or operating around wires, trees and work crews. This "gentle as your hand" action of metered oil control, plus solid outrigger stability, cuts the margin of human error, keeps production and safety records at their highest. And, Hydrocrane hydraulic top speed is just as smooth and shock-free as its "inching" motion.

Feature by Feature — It's YOUR Crane

- **telescoping boom reaches in and out, over and under**
- **quick setups and knockdowns, road speeds up to 50 mph**
- **stable, level work base with four power-set outriggers**
- **mounts on new or used commercial truck**

Your Bucyrus-Erie distributor will give you all the facts. Ask him to prove them with a demonstration. Write Dept. 7H59 for free bulletin. Bucyrus-Erie Company, South Milwaukee, Wis.

BUCYRUS ERIE®

Over 50% of Hydrocranes sold last year were REPEAT SALES

new record of about $5 billion in 1958. This is up slightly from the previous peak of $4.9 billion set in 1957, according to Ebasco Services Inc. Competitive bidding accounted for 47½ per cent of the total 1958 public utility financing.

Figures show that, of the $5 billion offered in new securities, gas and electric companies were involved in financings totaling about $3.75 billion.

In commenting on the financing needs of utilities in 1959, Ebasco foresees a slight decline in the amount of new securities to be offered. However, it expects utility financings in the 1960's to exceed substantially the peak set in '58.

Public Service of Newark continues growth

Public Service Electric & Gas Co., Newark, N. J., expects to add 27,000 heating customers in 1959. Last year the company added more than 25,000, bringing the total heating customers to approximately 245,000.

To meet increased demands of both heating and other consumer demands, Public Service will install more than 300 miles of gas mains, 23,000 services, and 28,000 meters this year, Total cost: $25 million.

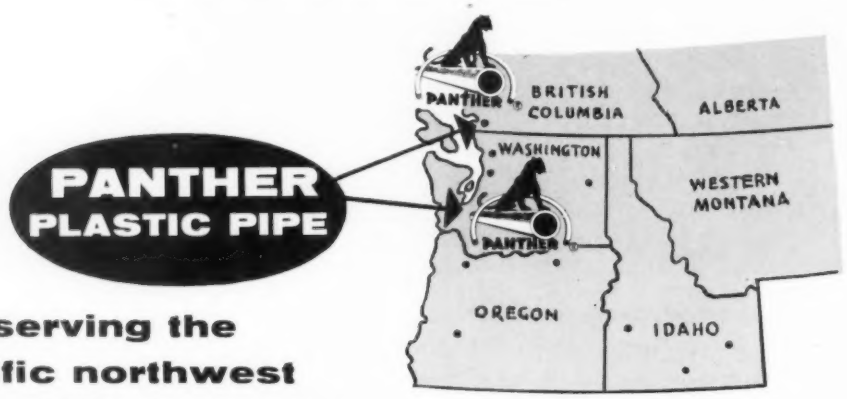
The program of converting appliances from mixed to straight natural in certain areas is continuing this year.

Southern Union Gas Co., Dallas, opened new headquarters in Flagstaff recently as part of its expansion in northern Arizona. The $50,000 building, with 5000 sq ft of floor space, houses both local and Arizona district offices.

Long Island winds up 9-month sales contest

Long Island Lighting Co. ended up its nine-month sales contest by awarding a Caribbean cruise, a 10-day trip to Miami, and 10 wrist watches to 12 Long Island plumber-dealers who were named as top salesmen and installers of gas space heating and water heating units.

Lew Jackson, LILCO sales manager, revealed that LILCO's sales department made 5875 dealer contacts and 10,425 plumber contacts. The purpose of the contacts, he said, "was to help our good friends in retail selling and to explain and advise how to best use and apply



. . . serving the pacific northwest with GAS main and service lines

WITH NATURAL GAS NOW IN THE NORTHWEST, WESTERN PLASTICS CORPORATION IS IN AN EXCELLENT POSITION TO SERVE YOU!

Here is plastic pipe extruded to American Gas Association and the Society of Plastics Industry recommendations as to weight, dimensions and tolerances. There is no electrolysis with Panther Pipe and it is flexible, light weight, non-rusting and is a "natural" for gas service lines, either new installations or replacement of old lines. It can be joined to metal lines without expensive precautionary measures.

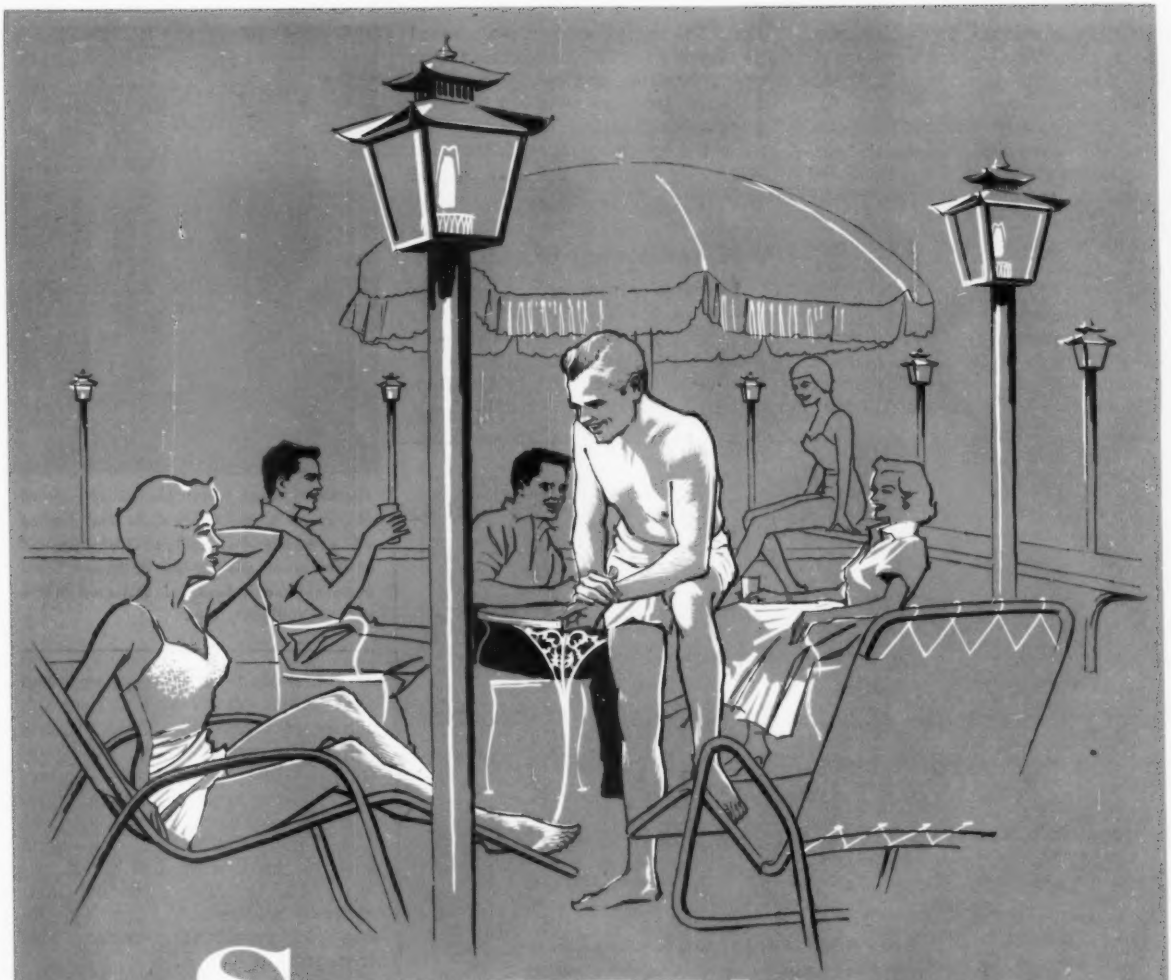
Enjoy the advantage of working closely with a local manufacturer who will meet all your requirements with this top quality plastic pipe. Write to manufacturer listed at right for prices and more information in the U.S.A. For Canada write to Pacific Plastics of Canada, Ltd., 687 Powell St., Vancouver, B.C.

PANTHER®

Manufactured by

WESTERN PLASTICS CORPORATION

3110 Ruston Way



The SENTRY Gaslite...

offering decorative...yet ECONOMICAL outdoor lighting

The SENTRY . . . perfect companion for today's trend to outdoor living . . . provides gracious lighting at a popular price.

The thrifty new SENTRY is an addition to the diversified selection of Gaslites by Arkla.

Install Gaslites. There is a model to fit your taste and budget.

Gaslite BY ARKLA
EVANSVILLE INDIANA

...biggest name in outdoor gas lighting

Consult your Gaslite Dealer or write
Arkla, Gaslite Division, Dept. A,
Shannon Building, Little Rock, Arkansas

LILCO's continual promotion program aimed at increasing sales of appliances, house and water heating."

"Gas heating installations for 1958 totaled 13,185 and water heating installations 10,226. Reported sales of gas dryers were 3034," Jackson said.

The plumber-dealer sales contests were divided into three periods: spring, summer, and fall. Four prizes were awarded at the end of each period. Determination of winners was based on a point system with the greatest number of total points indicating the winner. The point system was based as follows: (1) combination gas space heating and water heating, 20; (2) gas space only, 15; (3) gas water heating only, 5. Participants in the quarterly contests were eligible for the final grand prizes.

J-M completes acquisition

Transfer of all assets and the going business of L.O.F. Glass Fibers Co. to newly organized Johns-Manville Fiber Glass Inc. has been completed. J-M Fiber Glass, a wholly owned subsidiary of Johns-Manville Corp., has taken over seven plants and a research center at Waterville, Ohio. Plants are at Parkersburg, W. Va.; Houston; Corona, Calif.; and Waterville. Three are in Defiance, Ohio.

R. H. Barnard is president of J-M Fiber Glass Inc., the same post he held with L.O.F. F. H. May, Jr. is vice president and general manager. Formerly he was vice president, secretary and treasurer of L.O.F.

Northern Illinois displayed a 60-year-old gas stove in its Joliet store and service office during the utility's celebration of a century of gas service in Joliet. Store personnel shown here are costumed in the style of 100 years ago.

PSCo. of N.C. expanding

The Public Service Co. of North Carolina is seeking state permission to extend gas service into eight north central counties.

The area, composed of Caswell, Person, Granville, Warren, Halifax, Northampton Franklin and Vance counties, is one of the last sections not supplied with gas. Ground recently was broken for a 600-mile network of lines to bring gas service to a number of southeastern counties.

Public Service Co. currently serves Alamance, Orange, Durham-Wake, Chatham, and Lee counties.

New company for Missouri

Missouri's PSC has okayed a new company's plan to build a distribution system serving three northeastern Missouri communities.

Central Missouri Gas Co., headquartered in Kirksville, will serve Greentop, Queen City and Kirksville. The company now has to get

REYNOLDS

NRT-8010 SERIES

New House Service Regulator

NEW ALUMINUM BODY AND TOP
CAST IRON INLET UNIT
V-TYPE STAINLESS STEEL BAND

ONLY ONE STAINLESS SCREW with nut to remove for complete orifice and valve pocket. Permits exchange of diaphragm case without removing inlet unit from line.

Supplied as:

1. No seal type
2. No seal type with automatic cutoff
3. Internal diaphragm operated relief valve for complete over pressure protection
4. Internal diaphragm relief and automatic cutoff

REYNOLDS
REGULATOR CO.
ANDERSON, INDIANA

FPC approval of its plan to buy gas from Michigan-Wisconsin Pipe Line Co. at a point on the Missouri-Iowa line.

Central Missouri expects to spend some $2.1 million on a 26.5-mile line and the three distribution systems. Within five years its domestic customers will number 3755 with 404 commercial and industrial users.

GAS • News Notes

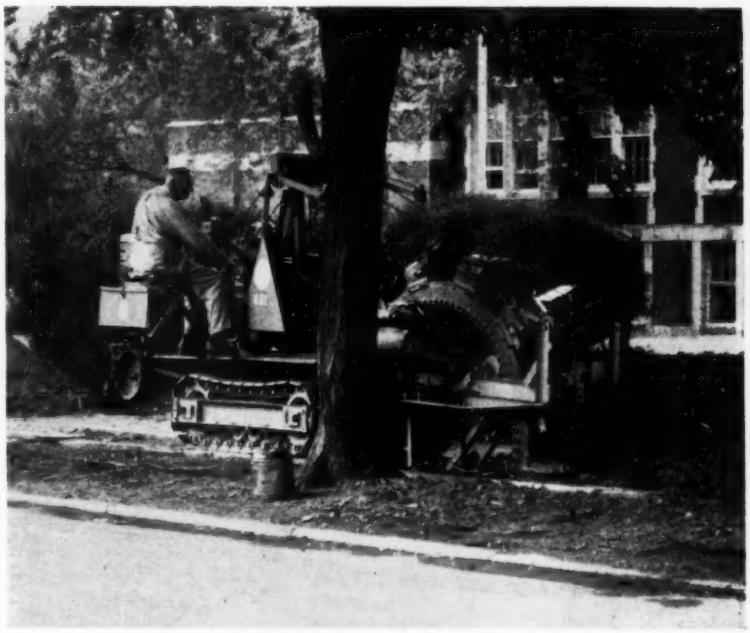
Western Kentucky Gas Co., Owensboro, recently completed negotiations for the purchase of the Mayfield (Ky.) Gas Co. Western Kentucky is now operating the system, serving some 2500 customers.

Greater Winnipeg Gas Co. is the new name of the Winnipeg & Central Gas Co.

General Controls Co., Glendale, Calif., has set up a European subsidiary. Located in Dusseldorf, West Germany, the new operation, General Controls G.m.b.H., will act initially as sales and distribution center for Continental Europe. Expansion of these functions to England is planned.

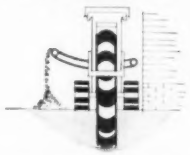
Safe-T-Clad Division, Seamless Rubber Co., has appointed Royston Laboratories Inc., Pittsburgh, as

One of the new gas light installations made by Dresser Manufacturing Division, Bradford, Pa., one of the Dresser Industries. Dresser is helping gas companies promote the sale of gas lights across the country. Piping was joined with Dresser gas fittings.

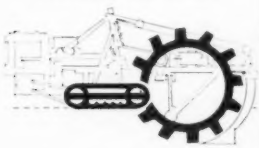


Nothing digs trench in the city like a Cleveland "Baby Digger"

PUTS TRENCH WITHIN 20 INCHES OF A PARALLEL WALL



MORE THAN 30 USABLE COMBINATIONS OF CRAWLER AND DIGGING WHEEL SPEEDS



GIVES YOU THE RIGHT COMBINATION of POWER and SPEED FOR EVERY SOIL AND JOB CONDITION

If your jobs involve city and suburban trenching, a trim maneuverable Cleveland 92 is the trencher for you. This "Baby Digger" has the practical features and advantages that give you greater, more economical production in crowded areas *...more trench...in more places...at less cost.*

- Only 4' 6" wide over its crawlers.
- Shiftable, reversible conveyor.
- Digs easily past trees, poles, fences, etc.
- Digs 10" to 20" wide...down to full 5' deep.
- Full crawler mounting...completely maneuverable...perfect balance and stability...easy on lawns, sidewalks, etc.
- Finest crawler on any trencher...long-lived...non-packing...easy-rolling...friction-free...sealed bearings...200-hour lubrication.
- Easily portable...hustles from job to job at safe, legal-limit truck speeds.
- Used on thousands of miles of trenching for gas...water...sewer...telephone...electric power...building footings...airport, highway construction.

fast • accurate • clean • dependable
nothing digs trench like a Cleveland

The CLEVELAND TRENCHER Co.

20100 ST. CLAIR AVE. • CLEVELAND 17, OHIO

Good Everywhere ®

exclusive marketing distributor in the eastern U. S. New exclusive distributor in the western, central, and southwestern states is Nee & McNulty Inc., with offices in Tulsa, Denver, and Houston.

Work is under way on Consumers' Gas Co.'s $647,000 transmission line to serve the city of Peterborough in Ontario with natural gas. Working on the 19-mile, 8-in. line are Shaw Construction Co., Toronto; Corcoran Construction Co., Kingston; and Harvey White, Windsor.

One of the most interesting and largest single projects undertaken in Southern Union Gas Co.'s pioneer days was the construction of the first pipeline to cross the Continental Divide. The 10- and 12-in. line extended from the San Juan basin in northwestern New Mexico across 200 miles of Indian reservation and uninhabited public domain to the cities of Albuquerque and Santa Fe, N. M. Pipeline R-O-W was surveyed by sighting from one topographic feature to another and then detailed by dropping welding rods tipped with flags from an airplane. All pipe and equipment used on the western slope of the Continental Divide had to be transferred to a narrow gauge railroad in Colorado and hauled across Cumbres Pass.

Engineering PLUS . . .

makes the difference in pipeline cathodic protection

E. R. P. corrosion engineers check an exposed leak area. Here they correlate pipe potential and line current measurements for electrolysis.

It takes a lot of know-how to protect a pipeline from corrosion. That's why corrosion engineers at E.R.P. keep abreast of the latest instrumentation. Whether they are protecting an old pipeline or preventing corrosion on a new line, they use every modern method to be sure each cathodic system is as effective as possible.

That's what makes the difference in E.R.P. cathodic protection: engineering when the cathodic system is designed; when it's installed; when periodic corrosion surveys are made to check for environmental changes.

If you are looking for pipeline protection, E.R.P. is ready to serve you. For full information write for Bulletin E-47.41.

ELECTRO RUST-PROOFING CORP.
A SUBSIDIARY OF WALLACE & TIERNAN INC.
30 MAIN STREET, BELLEVILLE 9, NEW JERSEY
CABLE: ELECTRO, NEWARK, N. J.

Western Gas Service Co. is the new name of Lea County Gas Co. The firm, founded in 1935 with 700 customers and five employees, now serves more than 40,000 consumers in an area between Silver City and Elkhart, Kan. More than 20,000 customers are in the El Paso area. Western Gas recently acquired gas and water property rights of Southwestern Public Service Co.

Carlon Products Corp., Aurora, Ohio, has purchased assets of United Pipe & Tube Co., Lubbock, Texas. The new facilities, operating under Carlon's name, will serve the west Texas area with the company's complete line of plastics pipe and fittings. It will produce plastic-coated steel underground pipe. Carlon expects to add a complete line of plastic-coated metal pipe to its present line of plastics pipe and fittings.

The Tenite plastics development laboratory of Tennessee Eastman Co., manufacturing division of Eastman Kodak Co., at Kingsport, Tenn., has been enlarged by about 5000 sq ft.

GAS · PEOPLE

John Loiseau
PSCo. of Colo.

Robert Person
PSCo. of Colo.

JOHN E. LOISEAU has retired as president of Public Service Co. of Colorado, Denver. Simultaneously, Loiseau was elected chairman of the board and ROBERT T. PERSON was elected president. The board also expanded the duties of Executive Vice President WILLIAM D. VIRTUE to the new post of executive vice president in charge of company operations. He will continue to serve as treasurer and principal financial officer. WALTER W. HOWELL, assistant vice president, was advanced to vice president and principal accounting officer, succeeding Virtue in that capacity.

CHARLES C. WHITTELSEY, president of Ford, Bacon & Davis Inc., has been elected chairman of the board. He succeeds EVERETT S. COLDWELL, who has retired after 33 years with the firm. Mr. Whittelsey will continue as president and chief executive officer.

L. B. Foster Co. has added four new sales representatives to its staff. LEONARD A. MCGOVERN, assigned to the New York office, will cover the Philadelphia area. RICHARD P. GURLEY is sales administrator of the construction products division of Foster's Chicago office. DONALD J. CIER has joined the sales staff of the Los Angeles office, and will cover the

William Virtue
PSCo. of Colo.

Walter Howell
PSCo. of Colo.

SOONER BOOMERS "team up" for laying large diameter lines!

Construction crew at Laclede Gas Company, St. Louis, is shown lowering in a section of coated and wrapped steel main in the Kirkwood area of St. Louis. Note two Sooner Boomer units are being used, assisted by a crane. For over 2 years, Laclede Gas has made good use of their Sooner Boomer units, keeping them busy throughout the year.

Rubber-tire mounted SOONER BOOMER does work of 2 conventional machines!

The only proven side boom on rubber tires, the Sooner Boomer —designed to handle 10" pipe— eliminates unnecessary right-of-way damage on city work as shown above. It also eliminates the need of pipe stringing along city streets ahead of ditch. A low center of gravity makes the Sooner Boomer highly stable, loaded or unloaded. Highly maneuverable, it operates at road speeds up to 27 MPH. The 12-ft. boom makes it possible to lower in over spoil. Other features include all-hydraulic operation; hydraulic controlled counter weights; power steering; perfect operator visibility; lowest initial cost and lowest operating cost! Call, wire or write for complete details now!

SOONER BOOMER
MFG. DIV.
Oklahoma City, Oklahoma

PHONE
TR 8-2127

P.O. BOX
8686

AMERICAN®
insulated
meter connections

permanent
molded-on design
simplifies assembly

- Insulation covers pilot flange and extends up the body—minimizes possibility of short circuits caused by moisture. No loose parts.
- Tough Nylon insulation seals tight, resists crushing. High dielectric strength eliminates electrolysis.
- Insulated meter connections are interchangeable with standard connections —accepts standard caps and washers. Reduces inventory problems.

Ask your American representative for Bulletin 308 describing all insulated and standard meter connections.

AMERICAN® METER COMPANY
INCORPORATED ESTABLISHED 1836

Executive Offices: Philadelphia 16, Pa.
Sales offices in principal cities.

Northwest. JOHN B. MANNING will specialize in pipe sales in the Pittsburgh office.

ROBERT M. JOHNSON has been named western regional manager of General Controls Co., Glendale, Calif. He will be responsible for operations in the 11 western stations, with supervision over branch offices in Los Angeles, San Francisco, Portland, Seattle, Denver, Salt Lake City, and Phoenix. For the past six years, Johnson has been Los Angeles branch manager for General Controls.

W. F. Weimer
Rockwell

Robert Johnson
Gen. Controls

WILLIAM F. WEIMER is director of public relations and advertising for Rockwell Manufacturing Co., a new position. Until his recent appointment, Weimer was advertising manager of Rockwell's meter and valve, municipal and utilities, and register divisions.

RICHARD C. BOULET has been named manager of Citizens Utilities Co.'s Bangor, Maine, gas property. Before joining Citizens, Boulet was manager of the West Bend division office of Milwaukee (Wis.) Gas Light Co.

NATHAN H. GELLERT JR. has joined Hood Northwest Sheet Metal Co. as president and general manager. Hood Northwest, a subsidiary of Hood Construction Co. of Whittier, Calif., operates gas appliance and equipment stores and sheet metal shops in Boise, Payette, Pocatello and Idaho Falls, Idaho.

WAYMAN E. HUMPHREY has been promoted to vice president of the Shawnee district of Oklahoma Natural Gas Co. Before his promotion, Humphrey was Muskogee district sales manager. He succeeds CHARLES H. RICH who is retiring as Shawnee district vice president after 40 years with

(*Continued on page* 108

AL-250
ALUMINUMCASE
METER

1. SLOW-SPEED OPERATION
2. SUSTAINED ACCURACY
3. LIGHT WEIGHT

- American® AL-250 Aluminumcase Meters operate at only 7 revolutions per cubic foot providing ample power, greater accuracy and longer life.
- Molded, 3-convolution Duramic diaphragms for all fuel gas services.
- Light weight, high impact strength, die-cast aluminum alloy body reduces shipping, handling and setting costs.
- Easy reading vented index box for full index visibility.
- Rated capacity 250 cfh of 0.60 sp. gr. gas at ½-inch w.c. differential — 5 psi working pressure.

AMERICAN® METER COMPANY
INCORPORATED (ESTABLISHED 1836)

General Offices: Philadelphia 16, Pa.
Sales offices in principal cities.

GAS CALENDAR

March

2- 4 . . AGA General Management Section Conference—Hotel Statler, Cleveland.
4- 5 . . Gas Conditioning Conference—University of Oklahoma, Norman.
9-11 . . Mid-West Gas Association Annual Meeting and Convention—Hotel Ft. Des Moines, Des Moines, Iowa.
16-20 . . National Association of Corrosion Engineers—Sherman Hotel, Chicago.
19-20 . . New England Gas Association Annual Meeting—Hotel Statler, Boston.
24-26 . . PCGA Combined Residential & Non-Residential Sales & Advertising Conference—Sacramento, Calif.
26-27 . . Oklahoma Utilities Association Convention—Mayo Hotel, Tulsa.

April

1- 3 . . GAMA Annual Meeting—The American Hotel, Bal Harbour, Fla.
6- 9 . . AGA Operating Section Distribution Conference—Netherland-Hilton Hotel, Cincinnati.
7- 8 . . Gas Compressor Institute (Sponsored by University of Kansas and Southwest Kansas Petroleum Industry)—Randall's Cafeteria, Liberal, Kan.
7- 9 . . AGA Sales Conference on Industrial & Commercial Gas—Hotel Warwick, Philadelphia.
14-16 . . Southwestern Gas Measurement Short Course—Drill Hall, North Campus, University of Oklahoma, Norman, Okla.
16 . . Pennsylvania Gas Association Production Conference—Drexelbrook Swimming & Tennis Club, Drexelbrook, Pa.
20-22 . . AGA-EEI Accounting Section Conference of Electric & Gas Utility Accountants—Sherman Hotel, Chicago.
22-24 . . Indiana Gas Association—French Lick-Sheraton Hotel, French Lick, Ind.
22-24 . . Natural Gasoline Association of America 38th Annual Convention—Baker & Adolphus Hotels, Dallas.
27-29 . . Southern Gas Association Annual Convention—New Orleans.

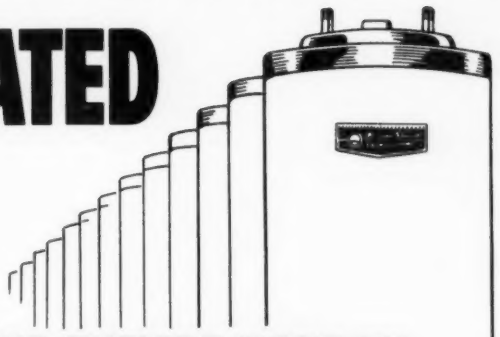
May

5- 6 . . PCGA Distribution Conference—Mar Monte Hotel, Santa Barbara, Calif.
11-12 . . AGA Eastern Gas Sales Conference—The Netherland-Hilton Hotel, Cincinnati.
18-19 . . AGA Operating Section Transmission Conference—Statler-Hilton Hotel, Dallas.
18-20 . . AGA-Mid-West Regional Gas Sales Conference—Edgewater Beach Hotel, Chicago.
19-21 . . Pennsylvania Gas Association—Pocono Manor Inn, Pocono Manor, Pa.
20-21 . . PCGA Home Service Workshop—Hotel Utah, Salt Lake City.
20-23 . . Florida-Georgia Gas Association Spring Convention—Fort Harrison Hotel, Clearwater, Fla.
21-22 . . Natural Gas & Petroleum Association of Canada—Hamilton, Ont.
25-27 . . AGA Operating Section Production Conference—Hotel Sheraton, Rochester, N. Y.

June

2- 4 . . Appalachian Underground Corrosion Short Course—University of West Virginia School of Mines, Morgantown.

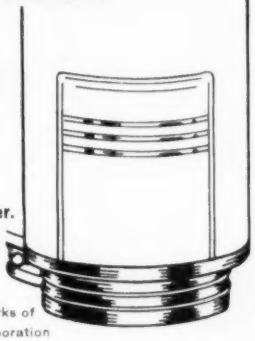
ONLY THE FINEST WATER HEATERS ARE PERFORMANCE RATED



...AND THEY'RE MADE BY AMERICAN-STANDARD

FINEST NAME IN PLUMBING AND HEATING

- With Performance Rating you easily match your customer's needs to the right size "rated" water heater.
- Performance Rating quickly makes you the water-heater expert; gives you quality and service to sell.
- Performance Rating means your customers won't run out of hot water.
- Glass-lined or galvanized steel tank; 20 to 65 gallons; full price range.



American Standard and Standard® are trademarks of American Radiator & Standard Sanitary Corporation

AMERICAN-Standard
PLUMBING AND HEATING DIVISION

Oklahoma Natural and other gas utilities in Oklahoma and Missouri.

DAVID H. JONES has joined the staff of Cathodic Protection Service, Houston. He will be in charge of the company's new Chicago office. Before joining Cathodic Protection, Jones was manager of cathodic protection sales for the Duriron Co. CPS also announces the appointment of CHARLES W. SCAMMAN to the sales division.

LOUIS W. MASON has been appointed sales manager, eastern area, and JAMES G. MORRISON sales manager, central area, of the National Tube Division of United States Steel Corp., Pittsburgh. Mason, succeeding the late ANDREW P. HARPER, will headquarter in New York and supervise sales offices in Boston, New York, Philadelphia and Atlanta. Morrison, succeeding Mason, will locate in Chicago, where he will supervise sales offices in Pittsburgh, Detroit, and St. Louis as well as Chicago.

David Jones
CPS

Charles Scamman
CPS

I. A. Ludwig
Ohio Fuel

H. C. Taylor
Ohio Fuel

National Tube Division of U. S. Steel Corp., Pittsburgh, has three new product managers. JAMES P. BACON is manager, tubing specialties products; JAMES H. DEGNAN is manager, oil country tubular products; and GEORGE O. NATIONS becomes manager, standard pipe products.

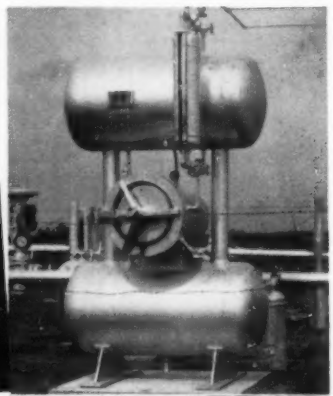
JOHN M. MARVIN has been named manager of a new sales territory established in Greensboro, N. C. by the plastics division of Eastman Chemical Products Inc. The new territory is composed of Virginia, North Carolina, and parts of South Carolina, Tennessee, and Kentucky.

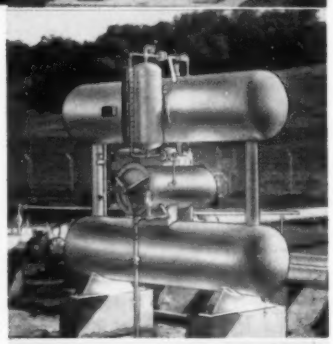
Four changes in the distribution department of Ohio Fuel Gas Co., Columbus, have been announced. I. A. LUDWIG, vice president and Toledo district manager, is retiring from active participation in the operation of the Toledo district. H. C. TAYLOR succeeds Ludwig as Toledo district manager. Ludwig is retaining his vice presidency and will work on administrative assignments from the company's Columbus offices. DONALD E. BARR succeeds Taylor as Elyria district manager, and DAVID E. YOUNG, assistant district manager in Toledo, succeeds Barr as Springfield division manager.

Roots-Connersville Blower, division of Dresser Industries Inc., has opened a new district sales office in Houston. Manager of the office is DANIEL FULTON. Fulton, with the company since 1948, will

PEERLESS MFG. CO.
DALLAS TEXAS

PEERLESS
Type "MP"
ODORIZER UNIT
WITH SILLERS
FLEX RING CLOSURE





The Peerless Type "MP" Odorization Unit has been designed to provide a complete odorization setup which is easily installed. This odorizer utilizes the Patented Peerless principle of liquid odorant injection.

LOOK AT THESE ADVANTAGES . . .

- ★ Accurate proportioning of odorant into line.
- ★ Safety tank built in. Cannot flood
- ★ Leakage is eliminated since all welded piping and packless valves are used.
- ★ It occupies a minimum of space. Only one foundation needed.
- ★ A minimum of piping is required for installation.
- ★ Installation time is reduced.
- ★ Maintaining odorizer is quite simple. Odorizer mechanism easily accessible.
- ★ Positive seal of odorizer housing with Sillers Flex Ring Closure.

Peerless Type "MP" Odorizers have many more outstanding advantages, all engineered to give you the most accurate odorizer available.

WRITE FOR BULLETIN 910

PEERLESS MFG. CO.

P. O. BOX 13165 ★ DALLAS 20, TEXAS

REPRESENTATIVES IN ALL PRINCIPAL CITIES

At the top is the MP-1000 odorizer with 85-gal. tanks. In center is the MPX-500 special with 200-gal. tanks and below is shown the specially constructed house for Peerless Packaged Odorizers.

Donald Barr
Ohio Fuel

David Young
Ohio Fuel

organize and manage the Houston territory, consisting of Texas, Louisiana, and southern Arkansas.

RICHARD H. COOK has been promoted to engineer in charge of operations in the gas production department of Rochester (N.Y.) Gas & Electric Corp.

JOHN B. LEWIS has been promoted to meter engineer by Connecticut Light & Power Co., Berlin, Conn. Lewis joined CL&P's general operating department in 1948 as an engineering assistant. In 1954 he was promoted to assistant engineer and in 1957 became assistant meter engineer.

ROBERT J. CHARTRAND has been appointed New York field engineering manager for Burroughs Corp.'s Electro Data Division.

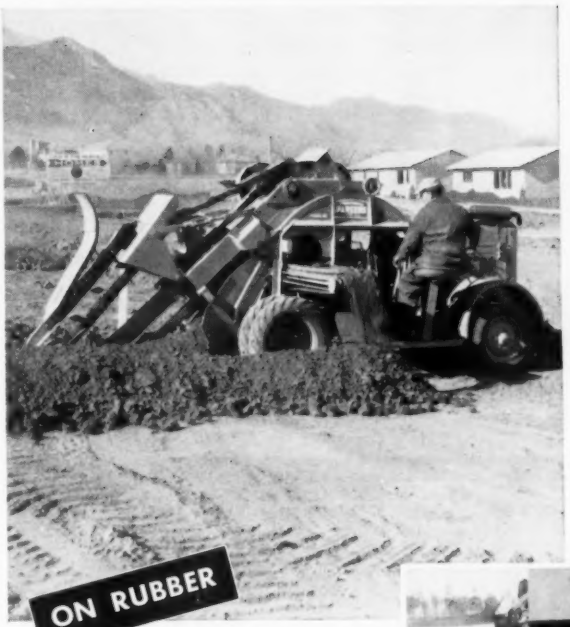
DAVID J. DAVIS is the newly appointed director of sales and advertising for Gar Wood Industries Inc., Wayne, Mich.

EMIL COPELAND has been named sales representative and service engineer for Lancaster (Ohio) Meter Parts Co. He will represent the company in the Midwest after extensive training at the factory.

ROBERT G. SCOTT has been named assistant general sales manager of B. C. Electric, Vancouver, B. C. He succeeds C. ALEX MANSON, who recently became the company's rate engineer.

David Davis
Gar Wood

Emil Copeland
Lancaster



NOW

PARSONS® brings you

a pair of small utility trenchers

ON RUBBER

Mobile as a truck, Parsons 88 Trenchmobile® steps up work schedules on widely scattered jobs. It drives around town from one assignment to the next at speeds to 12.6 m.p.h. On house-to-street service connections, pipeline reclamation, or mainline extensions, the 88 opens up to 14½ feet of trench per minute, 8 to 16 inches wide at depths to 5 feet. Positive downcrowd boom starts cut fast, holds accurate grade. It undercuts walks, curbs, cross-pipes — makes vertical set-ins. But that's not all, on many jobs, Parsons Trenchmobile — equipped with 6-foot blade (optional) — backfills its own trench.

ON CRAWLERS

Parsons little 77 Trenchliner® is not much wider than a yardstick, just 3 feet-10 inches wide to be exact. What's more it's only 5 feet-8 inches "low" with the boom in digging position. Weighs about 6700 lbs. for convenient trailer transport from job to job. Small in size but big in capacity, the 77 produces from 4.4 inches to 21 lineal feet of trench per minute, 6 to 18 inches wide, at depths to 5 feet. Its self-cleaning buckets are equipped with Parsons "Tap-In" teeth. Shiftable spoil conveyor is instantly reversible for controlled discharge. Better check what these small utility Trenchliners can do on your service lines, mainline extensions, etc. Ask your local Parsons distributor for a demonstration on your work, or write for literature.

Want more facts?

Mail to: PARSONS Company, Newton, Iowa (Division of Koehring Co.)

Send literature on: ☐ 88 Trenchmobile ☐ 77 Trenchliner

NAME..... TITLE.....

COMPANY..... DIV.....

STREET.....

CITY..... STATE..... P920 GAS

Philadelphia (Pa.) Gas Works has realigned its executive structure. Named to the newly created post of director of operations is EDWARD F. HUBBARD, former director of administration. He will direct customer service, distribution and production departments. Replacing Hubbard as director of administration is HAMMITT L. ROBBINS. Succeeding Robbins in the post of director of services is ROBERT R. LOCKHART. FREDERIC D. JUSTIN succeeds Lockhart as assistant director of finance and accounts.

Philadelphia Gas elected ROBERT W. LOBB, manager of customer relations department, and STEPHEN C. SYMNOSKI, superintendent of Station A, to membership on its executive staff.

The dissolvement of PGW's commercial department resulted in the establishment of three new departments: collection and meter reading, customer accounting, and customer relations. FRANCIS T. HAGER was named manager of collection and meter reading, ELMERT F. SAHLENDER is manager of customer accounting, and ROBERT W. LOBB is manager customer relations. HARRY J. SCHMIDT was promoted to assistant manager of the general accounting department.

GORDON L. CALDERWOOD has become assistant director of safety for Rochester (N. Y.) Gas & Electric Corp.

Consolidated Natural Gas System's rate department in Washington, D. C., has been reorganized. GEORGE N. REED, formerly system rate engineer, becomes manager of the rate department. NORMAN A. FLANINGAM becomes chief Washington counsel.

JACK GRANT has been named publicity director in Florida for the Houston Texas Gas & Oil Corp.

DONALD B. ROBERT is the newly named advertising manager of Southern Counties Gas Co., Los Angeles. He fills the vacancy created when HOMER LAUGHLIN chose to go on the company's disability rolls.

DAN R. GANNON has been elected vice president and general sales manager of Mueller Co., Decatur Ill. He has been general sales manager since December 1957. Joining Mueller in 1929, Gannon served as southwest sales manager, western sales manager, and field sales manager.

W. J. BESTMANN is now manager of the Continential Equipment Division of Fisher Governer Co., Coraopolis, Pa. He succeeds A. M. CAPPER, founder and president of Continental, who has retired. Bestmann has been general manager of the Woodstock, Ont., Canada, plant of Fisher for the past three years.

ROBERT L. ADAIR is manager of sales of the supply division of Corrosion Rectifying Co., Houston.

DOUGLAS R. COTTERMAN, an engineer in Ohio Fuel Gas Co.'s industrial department at Athens, Ohio, has succeeded HARRY S. METIER as Circleville manager. Metier was with OFG for 25 years, starting in 1934 as a salesman in Chillicothe. HAROLD W. HAUGHT has been named local manager for OFG in Chillicothe. He succeeds JAMES W. COLE, who has been named Bellaire division manager of Ohio Valley Gas Co.

More than

2 MILLION FEET OF ½ INCH KRALOY SERVICE PIPE

already installed

Since 1945 more than two million feet of one-half inch Kraloy Plastic Pipe has been installed for natural gas service lines. This one-half inch PVC pipe has done a job superior to that of ¾ inch, and larger pipe, when made of other materials.

One-half inch Kraloy PVC Pipe can also supply more than an adequate volume of natural gas to your customers. Kraloy can do this because of its mirror-smooth interior walls which result in an extremely high C factor.

Other Kraloy advantages:

1. Kraloy is permanent—not subject to electrolysis, rot, rust or scale.
2. Kraloy's flexible strength allows it to be installed faster and easier.
3. Kraloy's lighter weight lets your trucks carry more pipe footage.
4. Kraloy delivers cleaner gas—reducing foreign deposits in jets, valves, etc.

WHEN YOU SPECIFY YOUR NEXT INSTALLATION, DO AS OTHER LEADING GAS COMPANIES DO... SPECIFY KRALOY PVC PLASTIC PIPE!

Representatives:
Steele & Associates—Atlanta, Georgia
The Mack Company—Houston, Texas
H. J. Hodes—Kansas City, Mo.
The Crane Co.—Los Angeles & Denver

Call, write or wire for detailed information and specifications.

KRALOY *plastic pipe co., inc.*
4720 East Washington Boulevard, Los Angeles, California
Subsidiary of the Seamless Rubber Co., a Rexall Drug Co. Subsidiary

Two promotions in Ohio Fuel Gas Co.'s gas measurement department were announced recently. C. P. HOFFMAN is now assistant superintendent of gas measurement, succeeding Michael P. Debaets, recently named superintendent. M. W. DOUBIKIN has been promoted to office manager, replacing Hoffman in that post.

JOHN ANDERSON JR. has been promoted to district promotion manager of United Fuel Gas Co.'s Charleston (W. Va.) distribution district. Anderson formerly was commercial sales representative for Virginia Gas Distribution Corp.

ROBERT G. GENTRY was promoted to air conditioning manager for the Charleston Group companies of Columbia Gas System.

C. ALEX MANSON, B. C. Electric's assistant general sales manager since 1956, has become chairman of the company's rate committee.

JOHN C. C. BYRNE has been elected vice president, finance, of Robertshaw-Fulton Controls Co., Richmond, Va. MILTON E. CASE succeeds Byrne as controller.

WILLIAM T. CRAWFORD has resigned as chairman of the board of Stone & Webster Inc., New York. He remains as a director. WHITNEY STONE, formerly president, was elected chairman of the board and chief executive officer, and RICHARD N. BENJAMIN was elected president and a director. Mr. Benjamin has been president of Stone & Webster Service Corp.

WALTER C. FISHER has been appointed director of marketing and JAMES D. DOUGHERTY sales manager of Norge Division, Borg-Warner Corp., Chicago. Fisher heads all Norge home appliance advertising, merchandising, home service and other marketing operations. Dougherty directs all Norge distributing and field sales force operations.

HOWARD S. RIDDLE has been appointed coordinator of material standardization for the Columbia Gas System Service Corp.

New district sales offices have been opened in Los Angeles and Atlanta by Roots-Connersville Blower, division of Dresser Industries, Connersville, Ind. Heading

A MANUAL ON THE USE OF

Plastic Pipe and Fittings

in the Natural Gas Industry

This manual provides a wealth of background information invaluable to gas distribution men responsible for plastics pipe applications.

It traces the development and progress of plastics piping in the gas industry, details the properties and performance of these piping materials in gas systems, and describes both routine and unique applications gas companies are making of plastics.

GAS • *THE NATION'S NATURAL GAS AUTHORITY*
Dept. G. • 198 S. Alvarado St., Los Angeles 57, Calif.

Send me ..... copies of Plastic Pipe and Fittings. Payment enclosed.

NAME .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

the Los Angeles district as manager is H. W. NEWSOME, who joined Roots-Connersville early in 1958. This new territory consists of southern California. Manager of the new Atlanta office is PAUL E. JOHNSON. His territory covers Mississippi, Alabama, Georgia, Florida, and the Carolinas. Newly appointed district manager of the company's Detroit sales office is PHILIP J. BETTENDORF.

PAUL E. CATE has been named director of industrial and production engineering for the Fulton Sylphon division, Robertshaw-Fulton Controls Co.

Transfers of sales engineers TED ROBY JR. from Odessa to Dallas and WALTER O. EDRINGTON from Chicago to Pittsburgh have been announced by Grove Valve & Regulator Co., Oakland Calif.

ROBERT A. SHARPE has been appointed Sarnia district sales manager for Union Gas Co. of Canada Ltd.

VICTOR H. BODEN is manager-product marketing for Union Carbide Chemicals Co., New York.

R. A. Ransom Co., consulting engineers, has opened a New York office. Heading the office is LESTER SIMON, vice president and director . . . GEORGE T. HENDERSON is sales engineer is Los Angeles for the technical products division of Mine Safety Appliances Co. . . . HARRY L. FALCK is manager of petroleum and chemical sales of the Los Angeles district of Allis-Chalmers Industries Group. WILLIAM G. HONSAKER is assigned to the district as a sales representative.

HENRY K. STRAW is general sales sales manager of Roberts-Gordon Appliance Corp., Buffalo, N. Y. . . . Midwestern Manufacturing Co., Tulsa, has elected RAY O. BRANAM to the post of vice president and director . . . ROGER E. HOLMES is chief of the technical information bureau of Consolidated Electrodynamics, Pasadena, Calif. . . . Newly named sales engineer in the Houston territory for Mine Safety Appliances Co's technical products division is WILLIAM J. YOUNG.

Surface Combustion Corp., Toledo, appointed A. T. ENK as manager of the design department. He succeeds F. R. COLBY, who is now consultant to the chief engineer serving on special assignments . . . RONALD L. BENTLEY is managing the Dallas district office of Consolidated Electrodynamics Corp. He succeeded ROBERT D. ENOCHS, recently named CEC marketing manager of analytical and control instruments . . . BENJAMIN SCHIFFER, formerly with the FPC, and SAMUEL JOSEPH have been named vice presidents of H. Zinder & Associates Inc. . . . New western division sales representative for Crutcher-Rolfs-Cummings Inc. is JOHN A. SCHRAWGER, headquartering in Denver.

Deaths

ROLAND E. PALMER, who retired as secretary of Consolidated Natural Gas Co., New York, last November, died in St. Petersburg, Fla. recently.

ALBERT V. SCHWARTZ, 51, assistant treasurer of the Columbia Gas System Service Corp., died recently in New York. Mr. Schwartz joined Columbia in 1933 in the accounting department. In 1951 he became assistant controller and in 1953 was named assistant treasurer.

HARRY W. WILSON, 37, died from a heart attack recently in Panama City. In 1955 Mr. Wilson went to work on the Pacific Northwest Pipeline system, as an employee of Fish Northwest. Primarily he was responsible for the cost control phase of construction. He closed the Fish Northwest office in Salt Lake City in March 1958. Since then he had been in Panama City, working on Fish's Argentine project.

JOHN F. HICKMAN, 47, pipeline superintendent in the Boise, Idaho, area for Pacific Northwest Pipeline Corp., died recently in Boise. Before joining Fish Northwest in June 1955 as a welding inspector on the Pacific Northwest project, Mr. Hickman served as a welding inspector with Transcontinental Gas Pipe Line Corp., Williams Brothers, and Brown & Root. He served as chief inspector until 1956 when he joined PNW as a pipeline district superintendent.

GEORGE B. JOHNSON, 49, who was made executive vice president of Minneapolis Gas Co. last September, died recently. He joined the company in 1933 and in 1939 was named superintendent of the gas works.

There are more than 6000 types and sizes of Dresser® service fittings!

regular...

insulating...

extra rugged...

easily installed...

permanently gas-tight.

Dresser is the only manufacturer supplying a pipe coupling or fitting for every need in the gas industry.

DRESSER MANUFACTURING DIVISION

Bradford, Pennsylvania

corrosion control

with ***DRESSERTAPE®***

begins here

endures here

Dressertape...the perfect pipeline protection . . . is the product of years of research and testing at the Dresser Corrosion Laboratories. This high dielectric plastic tape provides excellent electrical insulation while protecting underground pipe from soil chemicals, salt water, acids, alkalies, and oil.

Dressertape has high adhesive firmness, extra strength, sunlight resistance, and excellent aging qualities. In its narrower widths, it conforms perfectly to the contours of small diameter fittings and is ideal for service lines. You can also get it in widths up to 12-inches, and in thicknesses of 10-Mil or 20-Mil. Apply it cold—no pots, no fumes, no burns. The ditch can be backfilled immediately since no "setting up" period is required.

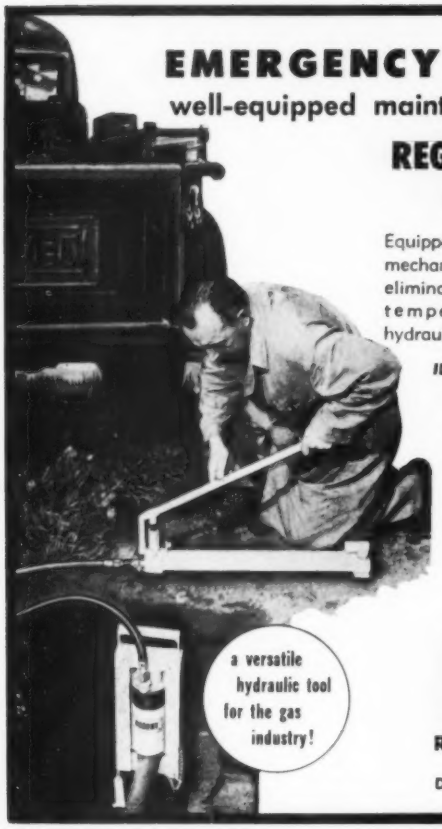
Send for Dressertape Booklet, form No. 548. It gives complete specifications, properties, and lists many additional benefits for *you.*

DRESSER

MANUFACTURING DIVISION

ONE OF THE DRESSER INDUSTRIES®

Bradford, Pennsylvania • Chicago • Houston
New York • Philadelphia • S. San Francisco
Toronto & Calgary



EMERGENCY or REPAIR

well-equipped maintenance trucks carry

REGENT FLOW-STOP PIPE SQUEEZERS

Equipped with safety locknut to allow mechanical locking during use and elimination of gas flow caused by temperature fluctuation on the hydraulic system.

IDEAL FOR:

- Emergency shut-off
- Repairing leaks
- Repair of ruptured service lines and mains
- Permanent closing service
- Speeds-up trenching operations
- Relocates lines and mains
- Lines up pipe for welding

a versatile hydraulic tool for the gas industry!

write for detailed information

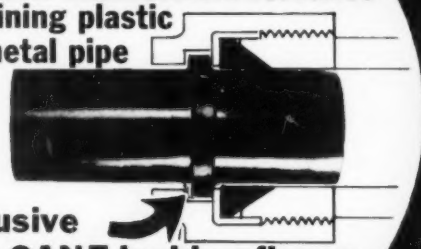
REGENT

REGENT JACK MFG. CO.
11905 Regentview Avenue
Downey, Calif. • SPruce 3-0103

FOR CORROSION-FREE GAS PIPING SYSTEMS

NEW! PREVENTS pullout!

SLOANE TRANSITION FITTINGS
for joining plastic and metal pipe



exclusive SLOANE locking flange
fits into compression fitting groove
to give positive pullout prevention.

Sizes from ½" to 2" in either PVC, ABS or Butyrate. Metal stiffener built into fitting assures dimensional stability under load. Available in new service and reliner service sizes.

remember SLOANE – over 2,000 other types and sizes of plastic pipe fittings

WRITE! for our catalog

SLOANE MANUFACTURING CO.
7606 North Clybourn Avenue, Sun Valley, Calif.
telephone! . . . STanley 7-9893

GAS ASSOCIATIONS

NACE plans 15th annual conference and show

More than 1600 engineers are expected at the 15th annual conference of the National Association of Corrosion Engineers. The conference will be held March 16-20 at Chicago's Hotel Sherman. The 1959 corrosion show will be held concurrently, March 17-19, at the same hotel.

Practical ways to protect gas and oil plants, pipelines and other facilities against corrosion will be discussed. Plans call for 16 symposia and two roundtables. Symposia will include cathodic protection, chemical industry, corrosion inhibitors, corrosion principles, educational lectures, elevated temperature corrosion, general corrosion, general roundtable, high purity water, marine corrosion, oil and gas production pipeline general, pipeline and underground roundtable, plastics, protective coatings, and utilities.

New officers will be installed during the conference. They are: Hugh P. Godard, Aluminium Laboratories Ltd., Kingston, Ont., president; George E. Best, Solvay Process Div., Allied Chemical Corp., vice president; and A. L. Stegner, Tennessee Gas Transmission Co., treasurer.

Root named assistant to director of AGA Labs

Pieter Root Jr. has been named assistant to the director of the American Gas Association Laboratories, Cleveland.

Root joined the AGA in January 1947 as a test engineer at the Pacific Coast Branch Lab where he subsequently became assistant chief engineer, supervisor of testing, and in 1953, assistant manager.

GAMA's Whitelaw moves to Washington, D.C.

H. Leigh Whitelaw, executive vice president of the Gas Appliance Manufacturers Association, is now headquartered in Washington,

D. C. His office formerly was at GAMA's headquarters in New York.

In making the announcement, GAMA president Clifford V. Coons and managing director Harold Massey said "This move provides the association with direct Washington representation at a time when defense and industrial mobilization planning programs are being considered and implemented, and when matters dealing with excise taxes, military and government housing and other projects will require special vigilance."

Southwestern measurement course sets program

The 34th annual Southwestern Gas Measurement Short Course is slated for April 14-16 at the College of Engineering, University of Oklahoma, Norman.

Ninety teachers have been selected to teach the diversified subjects included in the program. The teachers come from universities, operating gas companies, and manufacturers of gas measurement equipment.

Subjects will range from fundamental problems through shop practices to engineering applications.

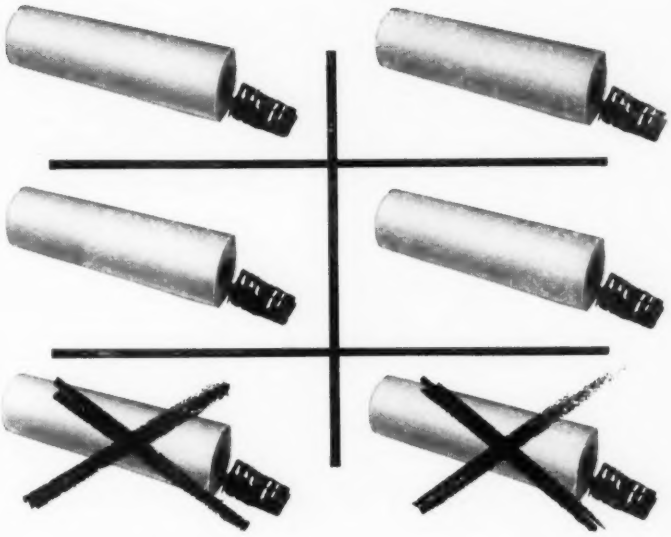
Pennsylvania gasmen plan April production meeting

A jam-packed one-day session is planned for the April 16 production conference of the Pennsylvania Gas Association. The meeting will be held at the Drexelbrook (Pa.) Swimming and Tennis Club in the Philadelphia suburb.

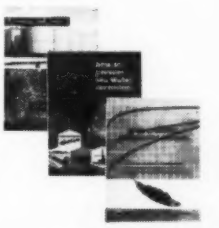
The morning session will include the following papers: "Peak Shaving for Natural Gas with LP-Enriched CCR Carrier Gas," by Robert L. Yeager, Harrisburg Gas Division; "New Odorization Equipment Being Installed by PGW," by Lee G. Cordier Jr., Philadelphia Gas Works; "Telemetering and Allocating Natural Gas in Dispatching," by Vian B. Silliman, United Gas Improvement Co.; and "Automatic High Pressure LPG Installation for Peak Shaving," by Herbert C. Jones, Gas Division, New England Electric System.

Following luncheon, Clarence B. Glover of United Engineers & Constructors will present a paper on CCR oil gas developments.

Upon conclusion of this program, attendants will tour Station



let 4 do the work of 6



That's right, because of lower circuit resistance four Standard Magnesium High Current Anodes will give the same protection as six conventional anodes. And this is accomplished without sacrificing current efficiency because Standard Magnesium anodes are made from H-1 alloy — the magnesium alloy proved in thousands of installations.

With Standard Magnesium High Current Anodes you get more ampere hours of protection per pound of metal consumed . . **plus** 50% more current output **and protection** than with conventional anodes.

Let one of our sales representatives give you the full story on how Standard Magnesium High Current Anodes give greater protection at lower cost.

NOW AVAILABLE!

These Three Informative Booklets on Corrosion:

1. ADVANTAGES OF HIGH CURRENT ANODES
2. HOW TO PREVENT SEAWATER CORROSION
3. HOW TO PREVENT CORROSION OF TANKS

Send for your FREE copies today stating which ones you desire.

QUALITY AND DEPENDABILITY THROUGH RESEARCH

Standard Magnesium Corporation

7500 EAST 41ST STREET — TULSA, OKLAHOMA

MAGNESIUM INGOT • MAGNESIUM ANODES • MELTING FLUX

STRENGTH AT THE PIPE JOINT

PVC - KRALASTIC
BUTYRATE - CYCOLAC

● We specialize in the joining of plastic materials. Write for information regarding your specific application.

WELD-ON

INDUSTRIAL POLYCHEMICAL SERVICE
17116 SOUTH BROADWAY • GARDENA, CALIFORNIA • DAvis 4-9041

time tested...
meter proved
Lancaster DIAPHRAGMS
complete assemblies • metal-rimmed • all-leather
Lancaster complete diaphragm assemblies for 1-A Sprague meters adjust to "watch-movement" accuracy regardless of case thickness or location of the main movement or carrier wire side bracket.
Grooved metal rims have added strength, rigidity. Leather is positioned in groove with precise machinery to assure uniformity of amount of leather and depth of pocket. Endless metal ring holds leather to rim with uniform pressure.
Lancaster-processed leather is soft, supple — yet firm, normally retains oil 20 years or longer.
All-leather, metal-rimmed or complete assemblies, Lancaster diaphragms improve accuracy, lengthen performance and minimize servicing.
Specify Lancaster for Sprague, Ironclad, Tobey and tin gas meters . . . and gas regulators . . . and use Lancaster's prompt repair service for Emco and Metric diaphragms.
"a meter is only as accurate as its parts"
Lancaster METER PARTS CO.
Manufacturers of Quality Parts for Gas Meters
POST OFFICE BOX 378 LANCASTER, OHIO
Canadian Representative: Ontor Limited, Toronto 2, Canada

CLIP THIS AND MAIL TODAY
if you have not subscribed to . . . GAS

GAS 198 SOUTH ALVARADO STREET, LOS ANGELES 57, CALIFORNIA
Standard Rates Apply to U. S. & Possessions

☐ Check herewith ☐ Bill me ☐ 2 years $3.00 ☐ 1 year $2.00

Name Title
Firm
Street
City Zone State

A of Philadelphia Gas Works. They will see carburetted water gas sets, a single shell and a two-shell CCR set for natural gas and kerosene reforming, a four-shell Hall oil gas set, four thermal oil gas sets converted from hand-clinkered carburetted water gas sets, and a three-shell CCR oil gas set converted from a hand-clinkered carburetted water gas set.

Dwight A. Dundore of Philadelphia Gas is chairman of the production committee of the Pennsylvania Gas Association.

Second builder award goes to New Jersey builder

The 1958 Gas Industry Builder Achievement Award went to Jacob R. V. M. Lefferts of Oak Hill Builders Inc., Middletown, N. J. AGA Managing Director C. S. Stackpole made the presentation during the National Association of Home Builders convention.

The New Jersey builder won national attention during 1958 with one of the new all-gas homes in his 650-unit Oak Hill tract near Red Bank. Built to accommodate two generations of a family under one roof, the home includes 11 gas appliances with 17 fuel applications.

Candidates for the award are chosen on the basis of their advanced methods of home construction, applications of new materials and equipment, and the use of modern merchandising techniques.

Pennsylvania group to cover leakage control

The Pennsylvania Gas Association, through its distribution committee, is sponsoring a one-day spring conference on March 26. The program will cover practical applications of modern methods of leak control.

Meeting place is the George Washington Motor Lodge in King of Prussia, Pa. (at the Valley Forge exit of the Pennsylvania Turnpike adjacent to Valley Forge).

Papers at the morning session will be presented by men who have done outstanding work with specialized modern methods and materials in the leakage control field.

The afternoon session will consist of a panel discussion on additional aspects of leakage control. Time will be allotted for questions from the floor.

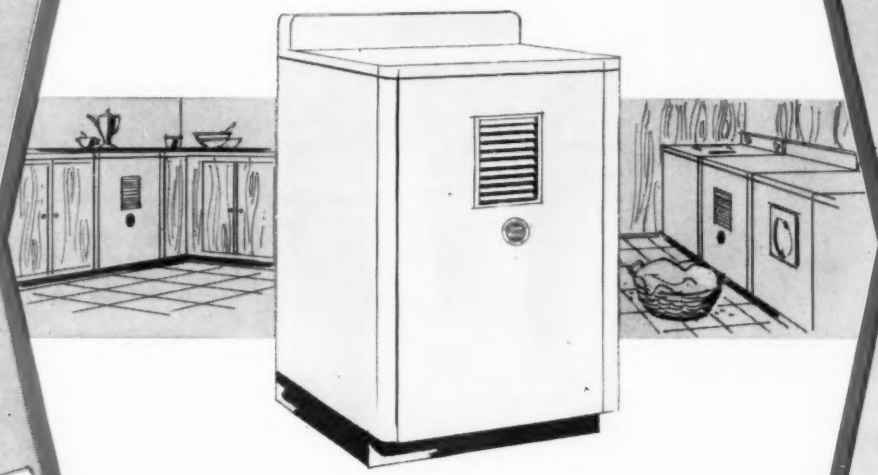
YOU SELL MORE BECAUSE...
YOU HAVE MORE TO SELL

WITH THE JOHN WOOD FULL LINE

plus

GAS TABLE TOP

AUTOMATIC WATER HEATER



MODERN DESIGN FOR
MODERN KITCHENS AND LAUNDRIES

Compact automatic water heater with porcelain top. Easy to install – provides luxurious hot water service for homes where space is limited. Glasslined and galvanized – full warranty. John Wood Table Top gives you more opportunities for sales.

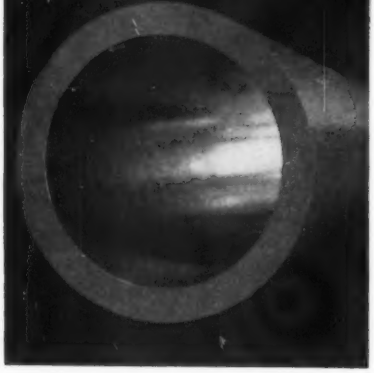
JOHN WOOD COMPANY

Heater and Tank Division

Conshohocken, Pennsylvania • Chicago, Illinois

quality piping from
a quality producer

cut corrosion costs with Byers PVC Pipe



Since PVC is a non-conductor, it is immune to galvanic or electrolytic attack. Smooth, inside and out. Does not pit, groove or tuberculate. Attacked by relatively few chemicals. Completely amorphous. Ageless. No oxidation. Immune to oxidants such as nitric acid, sodium hypochlorite, bleaches.

other advantages:
won't contaminate . . .
won't attract rodents . . .
installs easily . . .
low flow resistance . . .
no aging effects . . .
no environmental effects

Clip coupon for new PVC Pipe Catalog

A. M. Byers Company
Dept. A-3, Clark Bldg.
Pittsburgh 22, Pennsylvania

Name _____

Title _____

Company _____

City _____ Zone ___ State _____

CORROSION PREVENTION

Continued from page 31

r_n would be equal to 1. If there is just no relation at all between the two variables plotted, the two regression lines are at right angles, and r is equal to zero.

The regression equations and the corresponding values of r, in the present example, are as follows:

$$n = 1.01 - 0.19 \text{ Log } \rho$$
$$\text{Log } \rho = 4.15 - 2.06\ n$$
$$r_n = 0.62$$
$$a = 0.16 - 0.004 \text{ Log } \rho$$
$$\text{Log } \rho = 3.25 + 0.57\ a$$
$$r_a = 0.048$$
$$k = 86.8 - 9.94 \text{ Log } \rho$$
$$\text{Log } \rho = 4.01 - 0.012\ k$$
$$r_k = 0.35$$

The value of the coefficient r_a is so low as to indicate virtually no relationship. The same thing can be seen in *Fig. 2;* the two regression lines are almost at right angles. This means that the "area factor" a is *not* a function of soil resistivity; we could get about as good an equation by simply adopting an average value for a. However, since the work was carried out all at one time, a is still included in our expression, and will be so used.

How much relationship is shown by the other two coefficients? The factor n is very definitely related; a coefficient as high as 0.62 indicates a very substantial degree of correlation; it is not quite as high, for example, as the correlation between freshman physics and mathematics grades; it is higher than the correlation between history and mathematics grades. The coefficient r_k with a value of 0.35, is not so definite. In the opinion of most of the consulted works on

Mr. Frink's comments in the January Corrosion Prevention column (p. 18) covered that portion of the Texas-to-Florida pipeline from Baton Rouge, La., to Dade county, Fla. That portion is being tape-wrapped. The Coastal Transmission section, running from Texas' Rio Grande valley to Baton Rouge, is being coated with coal tar enamels.

CHEMTROL
PLASTIC
VALVES

BALL VALVE

Union-type end connectors, full-flow, quick opening, non-porous, never stick or gall, lightweight. ½" to 4" I.P.S.

CHECK VALVE

"Chem-Check"®

Full-flow, designed for minimum of head loss. New principle of seat seal for high and low pressure. ½" to 2" I.P.S.

"Chem-Cock"®

COCK VALVE

Teflon sealed, non-sticking full-flow cock for corrosion-service applications. ⅛" and ¼" I.P.S. and hose connectors.

NEEDLE VALVE

"Micro-Meter"®

Precise metering control and recording of settings, non-scaling, gall-proof needle. Resists internal, external corrosion. ¼"N.P.T.

"Micro-Flow"®

GLOBE VALVE

Fast opening and closing Teflon seats assure positive, "non-stick" seating in corrosive and scaling conditions. ¼" N.P.T.

Chemtrol valves, manufactured from a variety of plastic materials, are engineered for a wide range of corrosive environments, temperatures and pressures. Write for our handbook on plastic piping systems.
Distributor stocks nationally.

chemtrol®

CHEMTROL
10872 Stanford Ave.
Lynwood, California

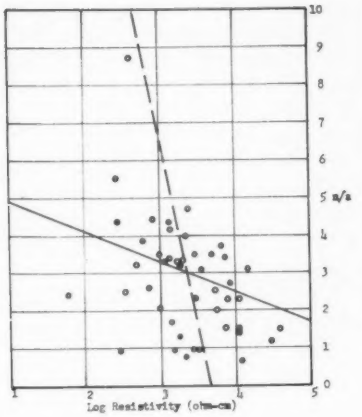


Fig. 4.

statistics, however, it does indicate a real connection. From the physical point of view, it seems probable that the correlation is quite real, but that there exists at least one other factor, besides resistivity, which goes to determine k.

As indicated previously, further studies will be made of the correlation of some of the derived functions with Log ρ. ■

Washington • *Cont'd.*

from page 29

While most observers expected a tough fight to keep the present 27½ depletion allowance this year, they did expect victory.

With the coal industry and the coal states headed for trouble, a reduction in the gas and oil depletion rate would help strengthen the competitive position of the fuel.

Gas industry supporters of the present depletion rate had figured that their toughest test would come in 1960—when Democratic congressional leaders are preparing to open up most of the tax laws anyway. But it could not come sooner.

A raft of bills have already been introduced in Congress to cut back the gas-oil depletion rate.

Sens. Williams (R., Del.) and Smith (R., Maine) are among the bipartisan sponsors of legislation to cut the rate from the present 27½ per cent to a flat 15 per cent. This will probably be the bill that depletion foes will push the hardest.

Another proposal would graduate

THE *FINEST* FOR MODERN GAS DISTRIBUTION SERVICE

NORMAC

Insulating Couplings AND Fittings

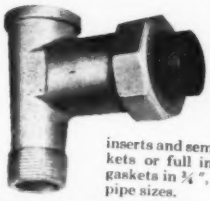
Malleable Couplings

Normac Insulating Malleable Couplings and fittings are available with polyethylene inserts and semi-insulating gaskets or full insulating rubber gaskets.

Malleable Service Ell

The insulating principle depicted above is carried out in all Normac Ells and Tees.

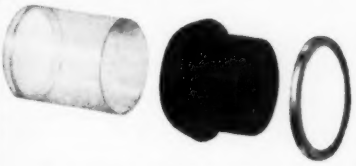
Brass Fittings



Normac insulating Brass compression end Tees, Ells and all compression end fittings are available with polyethylene inserts and semi-insulating gaskets or full insulating rubber gaskets in ¾", 1" and 1¼" iron pipe sizes.

NORTON McMURRAY has specialized for 20 years in the development and production of products solely for the Gas Industry. Whether your plans include modernization, or new, expanded facilities, Normac Gas Distribution Equipment will serve you well.

Insulating Gaskets



The Normac insulating principle incorporates an efficient combination of a polyethylene sleeve and a semi-insulating gasket or full rubber gasket and retainer ring.

New CATALOG

Write for your copy . . . it gives complete details and specifications of NORMAC equipment.

NORTON-McMURRAY Manufacturing Co.

919 North Michigan Avenue

CHICAGO 11, ILLINOIS

Couplings • Meter Bars • Sleeves • Cocks • Ball Joint Clamps • Service Tees and Ells

1897 1959

PIPE STOPPERS OF ALL KINDS

SAFETY GAS MAIN STOPPER CO. INC.

GOODMAN USED SINCE 1897 Z HANDLE & LOCKING SLEEVE GAS MAIN STOPPER

523 Atlantic Avenue

Brooklyn 17, N. Y.

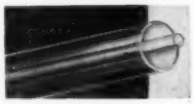
Cable Address GASTOPPER, N. Y.

Length after length . . . Mile after mile . . . Every inch of

BUSADA BUTYRATE (PLASTICS) GAS PIPING IS IDENTICAL!

IT'S CLEAR! YOU CAN SEE IT'S BY Busada

It is transparent . . . made from one specific material formulation containing the same physical properties shipment upon shipment. Its high quality is constant. Made to same O.D. as steel pipe with 2 wall thicknesses. Close tolerances insure leakproof, trouble-proof ease of installation. Complete line of fittings.



Butyrate pipe now available in black

Made by Busada Mfg. Corp., for

BUSADA SUPPLY CO. INC. 32-21 DOWNING STREET FLUSHING 54, NEW YORK

Representatives in: Boston, Los Angeles, Shreveport, La., Kingsport, Tenn., Grand Rapids, Mich.

for **leakproof, pressure-tight connections**

use TiteSeal®

SEALING COMPOUNDS

Heat and vibration-proof, non-solvent, will not shrink, crack or crumble. Makes all assemblies leak-proof and pressure-tight. Prevents rust, corrosion, joint seizure.

7 BASIC BLENDS

LIQUID WRENCH®

The super-penetrating rust solvent

LOOSENS rusted bolts, nuts, screws, 'frozen' parts

Liquid Wrench works *fast*... yet is absolutely safe for all metals and alloys.

2171

At Industrial, Automotive, Hardware, Plumbing Jobbers

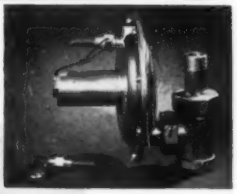
RADIATOR SPECIALTY CO.
Charlotte, North Carolina

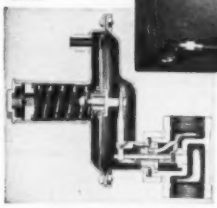
SOLDER SEAL PRODUCTS

UNIVERSAL

GAS SERVICE REGULATORS FOR CONVERSION OR PRESSURE ELEVATION

A REGULATOR, BREATHER VENT AND CATHODIC INSULATOR IN ONE PACKAGED UNIT





U. S. Patent No. 2,577,480. Other Patents Pending.

TYPE 51-R FOR EVERY INSTALLATION

EXCLUSIVE FEATURES NOT FOUND ELSEWHERE!

Exceptionally high relieving capacity obtained by new type internal relief valve. Remarkable by-pass check valve prevents over-shooting of low pressure and damage to meter.

SEND FOR BULLETIN NO. 521

UNIVERSAL

CONTROLS CORPORATION

P. O. BOX 13122 WALNUT HILL STA.
DALLAS 20, TEXAS

the allowance on the basis of gross income of a producer, from a high of 27½ per cent to a low of 15 per cent for those with incomes over $5 million a year. This could be a sleeper in the fight this year.

If a really dangerous threat to the depletion allowance develops, this sliding scale approach may turn out to be a compromise that could win passage.

This could occur if the lawmakers begin a serious move to open up the entire depletion question—a strong possibility. President Eisenhower has asked for changes in the depletion rates on various clay products; the coal industry wants an increase on its product; various sources want depletion extended to shale and shale oil, and the Treasury Department wants the depletion law changed to clarify the term "mining."

There is still another move that could gain strength as the depletion fight develops this year. This is a proposal, backed mostly by the so-called liberals in Congress, to limit the depletion allowance to recovery of initial investment.

Its supporters argue that since the allowance is explained as a method to enable "the quick recovery of a capital investment in a so-called risky area," it should be limited to recovery of the cost of the investment, rather than into perpetuity.

Treasury Department officials are opposed to this theory, pointing out that in order to restore depleted capital, such as gas reserves, additional exploration and development must follow. It is the aim of the allowance, they add, to take care of replenishing this capital wealth, without regard to an initial investment.

Meanwhile, Congress is drifting toward another study which could have serious effects on the gas industry.

As expected, legislation has been introduced in Congress to overturn the U. S. Supreme Court's reversal of the Memphis decision. Rep. Charles A. Vanik (D., Ohio) is sponsoring a bill (H. R. 1071) which would prevent a natural gas company from including in a rate schedule filed with the FPC "a proposed increase in any of its rates or charges . . . if such increase is

intended to apply to natural gas to be delivered under a contract previously entered into, unless the purchaser under the contract has consented to the actual amount of the increase."

This would restore the chaotic conditions existing for the past 18 months when, following an appeals court decision, a pipeline could not legally use the short-cut method of raising rates without the advance consent of all its customers. The FPC, of course, did not recognize the decision, and the Supreme Court recently overturned the lower court, upheld the traditional interim rate increase procedures, and turned down a request for a rehearing.

This measure stands little chance of passing. But as many before it, there is a possibility it could slip through on the coattails of some other unrelated measure.

All in all, the gas industry is facing a whing-buster of a year in Washington.

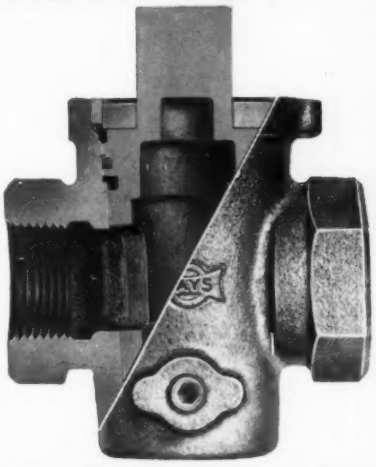
THE battle over what constitutes legitimate advertising for utilities is nearing a showdown on two fronts.

Both the Federal Power Commission and the U. S. Supreme Court are studying the problem of when advertising is legitimate for either tax purposes or as a rate base cost. Although the gas industry is not directly involved in the cases under study, the outcome will vitally affect future costs of the industry.

The high court this fall heard oral arguments on two cases involving the right of business firms to deduct from taxes the advertising costs of a campaign aimed at the defeat or support of legislation before Congress. The Internal Revenue Service says such advertising falls within the category of propaganda or political advertising specifically denied tax deduction by law.

At the Federal Power Commission, the question is whether similar advertising costs may be included as normal expenses in figuring rate base for tariff-setting purposes. In this case, the electric industry is specifically involved, through the Electric Company Advertising Program (ECAP). The

THIS GAS STOP WILL NOT STICK...

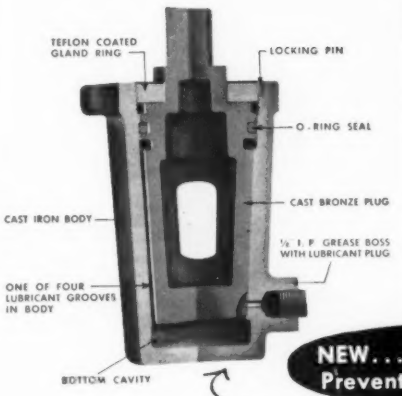


- A newly designed HAYS Lubricated and Tamper-Proof Gas Stop . . .
- Stop is completely lubricated at the factory . . .
- Four Grooves in body, and Lubricant Plug provide for pressure re-lubrication . . .
- Locking Pin positively prevents tampering at top of stop . . .
- O-Ring prevents top leakage . . .
- Teflon Coated Gland Ring reduces friction between top of plug and gland ring...

Re-Lubrication does the TRICK

HAYS

LUBRICATED TAMPER-PROOF SAFETY GAS STOP*



- Lower initial and turning torque . . .
- Extra grade gray iron body, gas service bronze plug . . .
- Individually tested . . .
- Black or Galvanized, Flat Head or Lockwing Pattern...
- Sizes: ¾", 1", 1¼", 1½", 2", for 125 psi. W. P.

Write for Folder 121 and prices.

*Patent applied for.

NEW... Solid Bottom Construction Prevents Leakage and Tampering

HAYS®

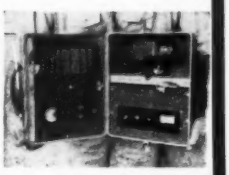
GAS SERVICE PRODUCTS

HAYS MANUFACTURING CO.

ERIE, PA.

WARRENGAS
the Concentrated Fuel
GULF GULFTANE LP-GAS
WARREN
PETROLEUM CORPORATION
LIQUEFIED PETROLEUM GAS DIVISION
TULSA, OKLAHOMA
SALES OFFICES:
FORT WORTH, TEXAS
HOUSTON, TEXAS
LOUISVILLE, KENTUCKY
MIDLAND, TEXAS
JACKSON, MISSISSIPPI
ST. LOUIS, MISSOURI
NEW YORK, NEW YORK
OMAHA, NEBRASKA
COLUMBIA, SOUTH CAROLINA
TAMPA, FLORIDA
LOS ANGELES, CALIFORNIA
BRYN MAWR, PENNSYLVANIA

Find it Faster with FISHER!
M-SCOPE PIPE FINDER
only $189.50
- Greatest depth penetration
- Greatest tracing distance
- Pinpoint accuracy
- One year between battery changes
- Built-in battery testers
- 90% less maintenance costs



Built for rugged field use; Transistorized circuits, compact fiberglass case.
SEND FOR FREE 1959 CATALOG
FISHER Research Lab., Inc.
Dept. G-3, Palo Alto, Calif.

NEW TRANSISTORIZED PIPE, VALVE AND CABLE LOCATOR

Contains many features never before found in a pipe locator:
- Single turn solid metal loops cast into the fiberglas case
- Switch on transmitter to allow for good and poor conductive ground
- Three-position sensitivity switch on receiver plus variable gain control
- Ten transistors—7 in receiver, 3 in transmitter

Plus these other deluxe features:
- Transmitter and receiver each operate on 4 flashlight batteries—average life 1400 hrs.
- Battery tester on receiver and transmitter
- Depth level indicator
- Adjustable drop handle
- Pulsed transmitter
- Will locate valves and pipes at greater depth and will trace pipes farther

MOST POWERFUL PORTABLE PIPE LOCATOR MADE TODAY!
Write for free literature
GARDINER ELECTRONICS CO.
Dept. 28
2545 E. Indian School Rd.
Phoenix, Arizona

TUFFITE KITS
for
Corrosion Control
↓CATHODIC↓
PROTECTION
↑ELECTROLYTIC↑
- Tuffite Bushings
- Tuffite Gaskets

Complete standard kits for 150 lb. flanges to 2,500 lb. flanges.
Also available, Tuffite Insulating Material for special designed flanges.
Write for Catalog
Safety Specialists to the gas industry since 1918
Stewart R. Browne MFG. CO., INC.
258 Broadway, New York 7, N. Y.
and 3285 Fletcher Drive
Los Angeles 65, California

industry is fighting to have the FPC agree that funds contributed to finance a series of ads attacking subsidized electric power and supporting the private power industry are normal and necessary.

The electric companies, at hearings before the Commission, argue that the advertising programs attacking a Tennessee Valley Authority expansion and other public power programs are necessary to protect the relationship of private utilities with financiers, customers, and employees.

The firms lost an initial round when a hearing examiner conducting the hearings agreed with professional staff employees of the commission that even if reasonable, the ads would have to be disallowed as normal costs unless it could be shown that they meet the test of "advertising" spelled out in the FPC's standard accounting procedures.

Until 1957, such "educational" or institutional advertising, even when political or legislative issues were involved, were generally considered as tax deductible or as part of costs (as long as no specific political candidates or parties were involved). The controversy arose when congressmen, including such staunch TVA supporters as Sen. Estes Kefauver (D., Tenn.), complained about the ads.

A year ago, the tax agents ruled against deductions by a group of gas industry firms who had contributed to advertising in the 1956 fight for the natural gas bill. ■

OPPORTUNITY FOR SALES ENGINEER

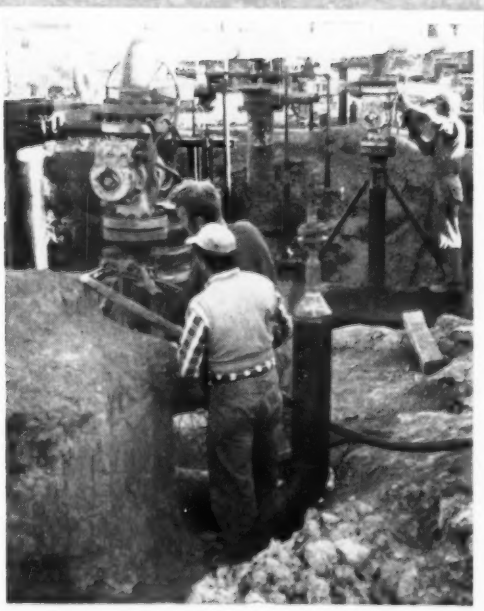
Man with experience in gas or water distribution network analysis wanted to sell the McIlroy Fluid Network Analyzer to gas and water utilities. Applicant must have basic knowledge of electricity. Position offers opportunity to travel extensively throughout the United States and Canada. Salary arranged. Submit photo and complete resume with education, experience and references. **Write to S. C. Jordan, Sales Manager, The Standard Electric Time Company, 89 Logan Street, Springfield, Massachusetts.**

The R. W. STAFFORD CO.
GAS CONSULTANTS—ENGINEERS—CONSTRUCTORS
Natural Gas Conversions
Plant Management and Operation
Peak Shaving and Standby Plants
Accident and Insurance Investigations
EVANSTON, ILLINOIS
2944 Grant St. — Phone UNiversity 4-6190

GAS

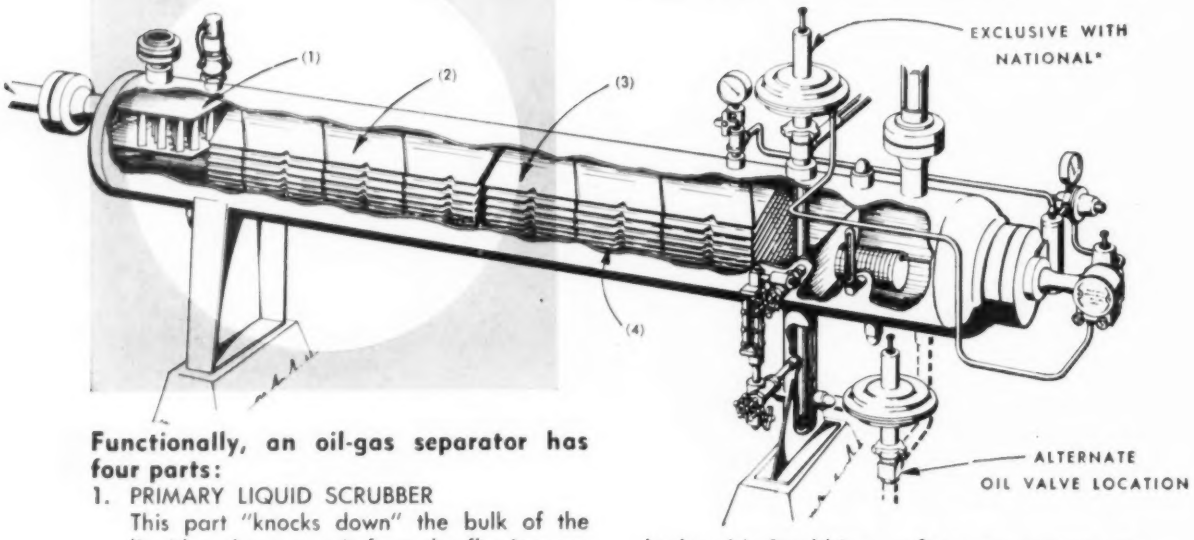
PIPELINE SECTION

CORROSION PREVENTION



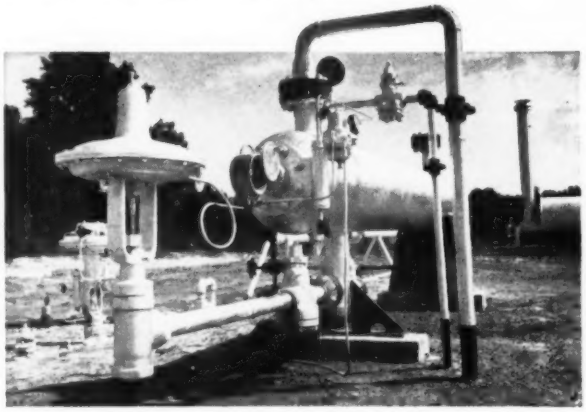
How Westcoast prefilmed sour gas lines ➡

NATIONAL® MONOTUBE® SEPARATORS



Functionally, an oil-gas separator has four parts:

1. PRIMARY LIQUID SCRUBBER
   This part "knocks down" the bulk of the liquid and removes it from the flowing gas stream immediately.
   National's present design is the result of field tests using full scale operational models which utilized numerous scrubbing elements. From these tests National's present design was found. Today, when you buy a National MONOTUBE Separator, you buy experience, not experimentation.
2. MAIN GAS SCRUBBER
   Also as a result of these tests, proper spacing and length of Main Gas Scrubber plates was discovered, so as to effect the greatest liquid removal from the gas stream.
3. FINAL GAS SCRUBBING
   The multiple field tests with flanged components dictated our design. National's "straight-vane" design accomplishes final liquid removal without the use of "excelsior-like" elements which are prone to be plugged with waxes, sands and other extraneous materials, including hydrates inherent in the normal oil-gas and distillate production operations.
4. OIL DE-GASSING COMPARTMENT
   What effects oil de-gassing? (a) Length of time in compartment. (b) Surface area of oil body. (c) Scrubbing surfaces to remove entrained gases. When (a), (b) and (c) are at a maximum, oil de-gassing is best. National's full-scale field testing found the proper ratios.



***EXCLUSIVE WITH NATIONAL!**

A field-proven, non-freeze liquid valve, particularly useful on high gas-oil ratio wells where entrance temperatures are near hydrate point. Ask your National man about this exclusive feature.

It's a National®

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

Crew pumps inhibitor diesel solution into 12-in. corrosion-prone gathering line. Miles downstream, the inhibitor solution exits from the 12-incher.

How Westcoast pre-filmed sour-gas lines . . .

By JAMES JOSEPH

THE problem for Canada's burgeoning Westcoast Transmission Co. Ltd. was—and is—sour gas.

From a half dozen major British Columbia and Alberta fields, sour gas is gathered, "sweetened" (at Westcoast's $19 million Taylor, B. C. processing plant), and piped to Vancouver and the Pacific Northwest via the 650-mile long, 30-in. pipeline.

To deliver its initial 400 MMcf/day (pressured by four compressor stations with a total 52,500 installed hp), the line needs a prodigious gas supply—and gets it from a complex gathering system. The system's some 135 miles of 4- to 26-in. lines tap Alberta's "sweet gas" fields as well as half a dozen British Columbia fields whose output is essentially "sour

. . . and retains continuity by daily injections

gas"—a highly corrosive combine of natural gas and distillates (containing hydrogen sulfide, carbon dioxide, methane and ethane).

The problem faced by Westcoast: how to protect its gathering system from blistering and pitting—and inevitable breaks.

Westcoast corrosion engineers have waged a successful and all out anti-corrosion campaign by: (1) pre-filming the gathering system with an organic ammine-type inhibitor; (2) monitoring all vulnerable sour-gas piping with hydrogen-sensing probes and weight-loss calculating coupons; (3) maintaining the interior film by addition of a ½-pt of inhibitor for each 1 MMcf of gas; (4) setting up rigid day-to-day analysis of probes and their findings.

Explains corrosion engineer J. A. Stewart, "sour gas incoming to the Taylor plant analyzes some 4 per cent H_2S and the same percentage of CO_2. Either of these acid gases can cause pipeline damage. CO_2, combined with the hydrocarbon liquids simultaneously carried in the lines—for both gas and liquids are carried—can lead to pipeline weight loss. H_2S blisters under gathering line pressures which may approach 1000 psi upstream—thus weakens the structure and may result in serious breaks."

Thus, even before its gathering system was pressure tested (prior to October 1957, when the mainline went into operation), Stewart and his engineers set about their corrosion-proofing.

In all, six lines (some 75 miles), were filmed with inhibitor. They included: (1) 4 miles of 12¾-in. line from the southeast Fort St. John field; (2) 8 miles of 18-in. line gathering from northwestern British Columbia; (3) 38.1 miles of 26-in. line from Westcoast's Buick Creek field; (4) 15.7 miles of 20-in. line which connects Buick Creek to the 26-incher; (5) 6.7 miles of 8-in. line tapping the Montney and Stoddart Creek fields; (6) and 2.9 miles of 4-in. line gathering from the Red Creek field.

Each line was individually and separately corrosion-inhibited.

How it was done: The inhibiting mixture consisted of a 10 per cent (by volume) solution of organic control-type inhibitor in a base of diesel fuel. This inhibitor solution was run between pigs, assuring a 360-degree interior film-coating.

The process: Line-filming was commenced on Sept. 6, 1957, the entire system coated by Oct. 24, 1957, after which the gathering system was hydrostatically tested and put into operation.

Into a tank-truck of diesel fuel was dumped (from 55-gal. bbl) enough inhibitor for the 10 per cent dosage. Diesel fuel was chosen as the carrier because, being a hydrocarbon, it was soluble with the inhibiting chemical. The tank was then circulated for an hour, thoroughly mixing the inhibitor, the circulation carried on at ambient temperatures (which varied between 12 and 32 degrees F).

A pig was then inserted into the line, and run some 150 ft downstream. Behind it the line was completely filled with the diesel-inhibitor mix, and a second pig inserted. Pressured by 30-75 psi of gas,

the sludge was run from 5 to 7 mph through the line.

A one quart sample of diesel solution was taken as the initiating point—as the mix was pumped into the line. Another quart was collected at the downstream end as solution was bled back into the tank truck via 2- or 4-in. couplings.

Ideally, Westcoast hoped to "lose" at least 25 per cent of its inhibitor—thus assuring sufficient chemical plating on pipe walls. Total diesel sludge loss, of course, depended upon pipe length and diameter.

By-volume losses of sludge varied between 10 and 60 per cent (less for the shorter lines, more for the longer, larger-diametered). Further, lab analysis of the quart samplings showed the desired 25 per cent inhibitor loss.

Says corrosion engineer Stewart, "this 25 per cent loss of inhibitor between initial concentration and final concentration was the proof we'd looked for—assurance that the inhibitor had plated interior pipe surfaces, and through the full 360-degrees."

Continues Stewart, "the polar-molecular inhibitor had strong attraction to the pipe. Result was an oil-wet film coating approximately one molecule thick, the inhibiting chemical in contact with the pipe, the molecule's hydrocarbon tails (diesel fuel) forming a kind of stratified buffer between the inhibitor and the gas and distillates flowing through the pipe."

Thus, through a relatively simple application, Westcoast achieved a mono-molecular wet-film coating along its miles of gathering lines.

To maintain the coating's continuity (during actual gas flow), Westcoast currently adds a half-pint of inhibitor to every 1 MMcf of gas (the inhibitor is introduced at each line's upstream end through chemical injectors).

Monitoring the anti-corrosion coating—while the line is under full flow pressure—is a system of continuous checks. Built into each line's initiating and terminal points (sending and receiving barrels) are corrosion access nipples. Involved are two types of corrosion-metering:

(1) Corrosion coupons: The coupons, of 10-20 low-carbon steel and 8-in. long x 7/8-in. wide x ⅛-in. thick, keep tab on weight loss and pitting.

(2) Hydrogen probes: Both vertical (Type "B") and horizontal (¼-in. SCH 80 pipe with .250-in. OD x .083-in. tubing), test for hydrogen buildup . . . thus, blistering.

Typically, corrosion-monitoring culverts are galvanized corrugated pipe, 48-in. diameter, and sunk to pipe level (a minimum 3 ft). Twelve inches of culvert protrude above ground, this to thwart drainage into the sumps.

Corrosion coupons: More sensitive than the pipe (typical: API5Lx52) the low carbon steel coupons are sandblasted, numbered and carefully weighed (to within 1/10,000th of a gram) before they're introduced into the lines. Coupons are exposed to stream flow for two weeks, are then collected and reweighed —to gauge weight loss and to test for possible pitting.

Hydrogen probes: (a) vertical type, on Casasco nipples, reach only to within ¼ in. of the pipe's bottom. Because of this gap, and because probe-sensitivity over the lower ¾ in. of reach is somewhat impaired, Westcoast has also installed the (b) horizontal type.

Horizontal probes (at the three terminal points of the 12-, 18- and 26-in. lines) lie on the pipe's bottom, assuring coverage of this vulnerable area (for remember, the line carries corrosive liquids as well as gas). Both type probes record on 0-25 psi gauges installed in culverts (readings are taken daily, radioed to Westcoast's headquarters in Vancouver).

How hydrogen probes work: Probe simulates pipe metal. As such, it consists essentially of a thin-walled tube and artificial cavity. Atomic hydrogen, working through probe's wall (even as the same gases would work through pipe's wall), is collected in the cavity and reverts to molecular hydrogen, vented through a hole in the rod, then routed through a capillary tube where hydrogen pressure (thus degree of corrosive action) is recorded on pressure gauge.

How coupons work: Coupons are merely pieces of test metal, slightly more sensitive than the pipe wall itself. They're exposed to corrosive gases, then lab-analyzed to gauge the extent, type and depth of attack.

Inhibitor solution is pumped from barrels into tank truck of diesel oil.

Follow-up pig is started down gathering line.

Hydrogen probes are permanently installed in the lines. However, they don't interfere with routine (and daily) pigging, necessary to remove distillates.

Probe-plotting to date indicates the success of Westcoast's original (and subsequent) inhibitor-filming.

For example, hydrogen probes went into service on Nov. 8, 1957. Following are typical gauge readings under stream-flow (800-900 psi) conditions:

date	*hydrogen pressure (psi)*
Nov. 8	4.5
Nov. 10	4.75
Nov. 11	5.25
Nov. 12	6.0
Nov. 13	6.5
Nov. 14	7.0
Nov. 15	8.0
Nov. 16	8.25
Nov. 17	8.5

Pigs after their run-through the 12-in. line.

From Nov. 17 to Dec. 6 readings have remained constant, at about 8.75 lb.

"These figures," Stewart points out, "are interesting. First, they indicate that hydrogen activity has stopped. Secondly, they show that when a line is initiated it takes awhile for a probe to become coated with corrosion-inhibitor—thus to stabilize itself along with the pipe it's monitoring."

For example, probes introduced on Nov. 8 were uncoated. Almost immediately they were attacked by hydrogen—and gauge readings jumped to 4.5 psi. Gradually, as daily injections of inhibitor coated them, corrosive action stabilized. Readings then leveled off . . . and have hovered at the 8.75 mark ever since.

"Actually," says Stewart, "those first 9 days merely indicated how the pipe itself would have been attacked were it not filmed . . . nor that half-pint of inhibitor continuously added for each 1 MMcf of gas, thus maintaining the film's continuity."

Continues Stewart, "what we're looking for is any sudden change in hydrogen pressure. We're not particularly alarmed at a 1- to 2-lb build-up day to day . . . so long as the build-up stabilizes within reasonable time. We'd worry—and expect trouble—should there be a sudden, radical build-up. Say, in the order of 10-20 psi. As of now, we interpret the steady 8.75 psi reading as indicative that hydrogen action has ceased."

And Westcoast, with no breaks nor corrosive build-up to date on its sour-gas gathering system, aims to keep it that way. ■

CORROSION PREVENTION

Coating steel pipe for gas service

By J. S. DORSEY and C. E. LEE
Southern California Gas Co., Los Angeles

CONTROL of external corrosion on gas distribution and transmission pipelines has been recognized for many years as being an important and necessary part of the operation of such pipelines. The cost of repairs and replacements has increased tremendously during the past few years and this has emphasized the economic benefits of corrosion control.

The prevention of corrosion on steel pipelines used in the gas industry is usually accomplished by coating the pipe with an insulating material, by the use of cathodic protection, or by a combination of both methods.

• Types of coatings

The standard coatings used at Southern California Gas Co. are listed in *Table 1*. There are, of course, many other excellent coatings and coating materials. However, in selecting a coating as a standard for use in our pipeyard, asphalt was chosen because it has given good service and it is an economical coating for use in the Los Angeles Basin, which is an asphalt-producing area.

Plastic tape is used to make field coating joints on straight pipe and smooth bends because a good coating is easily and quickly applied.

Irregularly shaped fittings are much harder to wrap and in most cases grease is used on these particular fittings. It is easy to put on and does not require any drying or setting up time before backfilling.

Asphalt paints are also used in conjunction with plastic tape on insulating flanges. Several coats are applied and sufficient drying time is allowed for each coat to dry thoroughly.

• Purchase specifications

Written specifications giving definite requirements play a major role in controlling quality of materials. The supplier knows exactly what is required and the purchaser knows that the material will have the basic qualities which laboratory tests and previous experience have indicated it must have in order to be suitable for the use intended. Care must be taken that purchase specifications do not restrict the use of new and better materials as they become available. Specifications must be continually reviewed and updated to provide for the use of such new materials; they must also be revised occasionally when field experience or changes in operating methods indicate this to be desirable.

An example of a coating specification is the one

TABLE I. STANDARD PIPE COATINGS

Items Coated	*Coating*
Pipe size 8-in. and larger	Filled asphalt Glass mat Filled asphalt Asbestos felt
Pipe size 6-in. and smaller	Filled asphalt Glass mat Filled asphalt Kraft paper
Valves, pressure control fittings, compression couplings, and leak clamps	Grease Cellulose membrane Grease Kraft paper
Field applied coating joints, service tees, butt-welding fitting, abandon fittings, pipe bends and patching asphalt coatings	Rubber primer Plastic tape Asbestos felt
Patching damaged coating on large pipelines	Asphalt primer Hot applied asphalt tape Asbestos felt
Valves on large pipelines	Asphalt primer Two coats of asphalt paint
Insulating flanges	Asphalt or rubber primer Plastic tape over edges of flanges and over nipples Asphalt paint over back of flanges and bolt heads Asbestos felt

Holiday detector, ball and rubber electrodes. Used on a machine that wraps two lengths of service pipe at once.

for filled asphalt shown in *Table 2*. This specification delineates the characteristics which the asphalt must have yet, at the same time, it is simple and short enough so that it is not confusing to the supplier and he can easily make simple tests of the asphalt during processing to insure that it meets the specification.

Every few months our laboratory makes more detailed tests than those listed in the specification. These tests measure the impact strength, flow resistance, aging, water absorption and other properties of the asphalt. These additional tests are more time-consuming than those listed in the purchase specifications, and for this reason have not been included in the specification. They do, however, provide valuable supplementary information which assures that the asphalt is of satisfactory quality. They also provide an indication of changes that should be made in the purchase specification if this proves to be necessary.

Large diameter pipe supported on bare ends.

The quality of asphalt that is used for pipe coatings must be superior and more rigidly controlled than that used for most other purposes. The asphalt is applied at 390-410 degrees F, and it must remain hot in storage tanks for several days without deterioration or filler settlement. It should be as hard and resistant as possible so that it will not be damaged while being handled and installed. Ground temperatures that prevail in the California deserts may be as high as 85-90 degrees F, and the asphalt has to be sufficiently resistant to penetration even at these temperatures so that it will not be damaged by roots, rocks or clods. In addition, the asphalt must be ductile at low temperatures. The ductility requirement becomes evident when observing ¾-in. service pipe being installed in the field. A 40-ft length of service pipe will whip and flex considerably as it is being carried, and the asphalt coating must flex with it without cracking. It is fortunate that the temperature in southern California seldom gets below 32 degrees F since the asphalt becomes much more brittle at low temperatures.

A typical pipe coating asphalt is made from Los Angeles basin crude asphalt stock by atmospheric and vacuum distillation of kerosene and naphtha to produce a 250-300 penetration bottom material. This is airblown for about 18 hours and a non-metallic filler added. This filler has low water absorption, low density, and uniform small particle size and effectively toughens the asphalt.

- **Yard wrapping**

A specification for yard-wrapped pipe is shown in *Table 3*. The Southern California Gas Co. pipeyard wraps several million feet of small-diameter distribution pipe as well as smaller quantities of larger diameter pipe. Large transmission lines are field wrapped by the installation contractors.

There are three wrapping machines in the pipeyard. One wraps service pipe, one 2-in. through 4-in. pipe, and the third larger pipe. All wrapping machines operate on the same continuous process of heating, cleaning, wrapping the pipe and inspecting the coating.

The bare pipe is heated to at least 180 degrees F and then cleaned with steel grit before the asphalt is applied. This removes all loose dirt, rust, and mill scale and provides a clean surface with a good anchor pattern for bonding the asphalt to the pipe. Thermostatic control of the pipe preheater and a uniform residence time of pipe in the heater assure that the pipe is always heated to the same temperature. Thermostatic controls are also used on the asphalt heaters.

This method of application results in a uniform coating thickness and an excellent bond to the pipe. This bond is essential in that it strengthens the coating from cracking under impact and prevents water migration under the coating after the pipe has been buried.

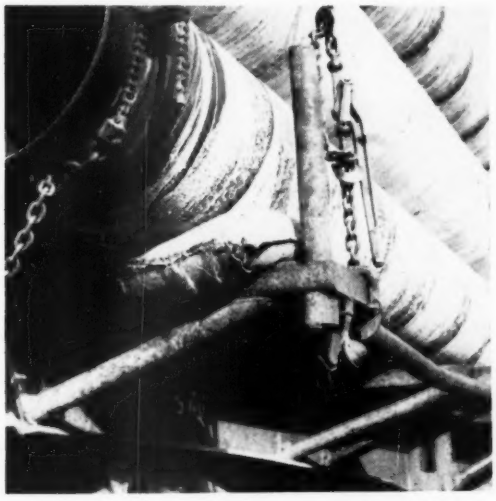
After the coating is applied, it is tested with a holiday detector as it leaves the wrapping machine. Very few holidays are found following the wrapping process. The coating thickness is also measured near

the ends of the pipe at periodic intervals to check for adequate thickness.

Company experience has shown that we are getting an excellent wrapping job in our pipeyard. Good specifications, good materials and a high quality of workmanship have been combined to produce a good product in an efficient and economical manner.

• Yard stockpiling

The company has just changed the methods of handling wrapped pipe in the pipeyard to allow more efficient use of equipment and storage space. At each wrapping machine the wrapped pipe is stacked in ricks 5 ft wide with 5 to 6 tons in each rick. These ricks are handled by a fork-lift and moved to permanent lay-down racks where the pipe is supported on the bare ends to avoid coating damage. When trucks are loaded to take pipe to the field, the rick is raised to truck bed level by the fork-lift and the pipe is rolled onto the truck bed by hand. The fork-lift has enough support area to prevent coating damage.



Bags of sawdust prevent damage during trucking.

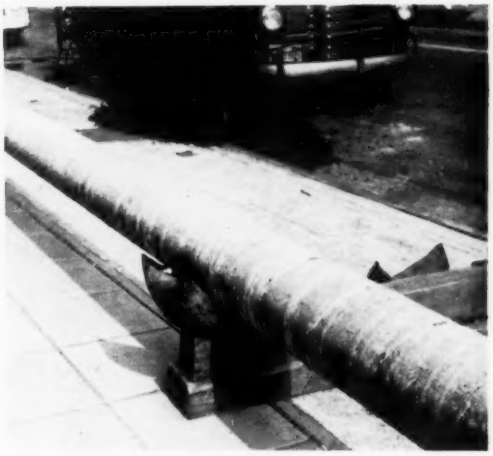
• Stockpile or string in field

Wide-webbed belt slings are used to unload pipe in the field. Chain or cable slings are not allowed.

When pipe is stockpiled in the field, the bottom tier is supported on the bare ends and other tiers are stacked directly on top. The height of the pile depends upon the length of time the pipe is to be stockpiled, size of pipe and the time of year. Care is taken not to put so much pipe in one pile that the coating will be deformed or damaged by the weight of the pipe.

When pipe is strung along the ditch, it is supported by the bare ends or by resting the coated portion on padded skids or bags. Old firehose makes a good skid padding for small diameter pipe.

Any damaged spots in the coating are repaired before lowering into the ditch. On small-diameter pipe the asphalt coating is removed around the entire circumference of the pipe at the point of damage. Plastic tape is then wrapped on the pipe in a manner similar to a regular field joint.



Padded skids do not damage coating when pipe is strung in field.

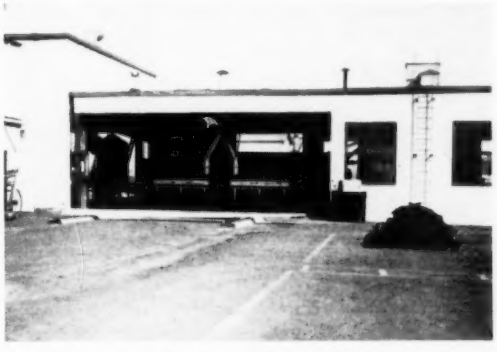
On large-diameter transmission lines, the repair is made with hot asphalt or with an asphaltic patching material which is applied hot. This eliminates the necessity for removing the asphalt completely around the pipe. On large-diameter pipe this would be a time-consuming process.

• Installation

Pipe may be installed in open trenches, or in bores. When it is necessary to bore under pavement the pipe is shoved or pulled in. In rocky soils, the open trench method of installation is used and wrapped pipe installed.

Trench bottoms are graded so the pipe is supported over its full length. The trench bottom and the backfill materials are kept free of rocks, building materials, pieces of pavement, and other materials that could damage the coating.

The soil around the pipe may contain small rocks but no large rocks are permitted to be closer than 4 in. to the pipe. Sand or selected backfill materials may be used in rocky soils to reduce possibility of coating damage and to improve bedding.



Overall view of enclosed wrapping machine. Note absence of fumes.

Fork-lift moves newly wrapped pipe in the pipe yard.

When pipe is installed in a bore, wrapped pipe is not used as bore pipe. The hole is bored first with an auger and then reamed to a diameter slightly larger than the wrapped pipe. Following this, the wrapped pipe is pulled through. The coating can be inspected visually at any bellhole along the bore.

So much pipe is now being shoved in bores that a need has developed for a method of determining the condition of the coating after the shove has been completed. Electrical resistance tests show promise in this direction, and there is a possibility that a Pearson detector type of instrument which will work over paving may be developed.

• Laboratory and field testing

A continuous program of testing and evaluating new coating materials is carried on in the engineering laboratory. Tests are made for such properties as electrical resistance, water absorption, impact resistance, tensile strength, resistance to soil deformation, etc. In addition to these, other factors are considered including ease of application, handling and storage of material, cost, necessity for new tools, methods or techniques, etc.

If a new coating material appears promising, field tests may be made under actual operating conditions. These often produce results which cannot be anticipated from laboratory tests. A coating which looks good in the laboratory may present so many operational difficulties in the field that its use is not practical; on the other hand, surprising increases in efficiency and consequent reductions in cost occasionally are experienced with the use of a new coating material.

The engineering department and the operating departments work very closely in evaluating and testing coatings both in the laboratory and the field. All departments concerned must approve a new material before it can be used as a standard coating.

In addition to these tests on new materials, tests are continually being made in the laboratory on the standard materials in use to determine if they meet purchase specifications. Random samples are selected for these tests, and if any deviation from the specifications are found, the purchasing department contacts the supplier. Minor deviations may be accepted if the quality of the material is not impaired, but material which is not acceptable for use is rejected.

• Field wraps

The quality of our plastic tape field joints depends upon having standard wrapping methods and thorough training of personnel. Tape wraps are easily inspected visually, but low voltage "jeeps" are available for use whenever visual inspection is inadequate.

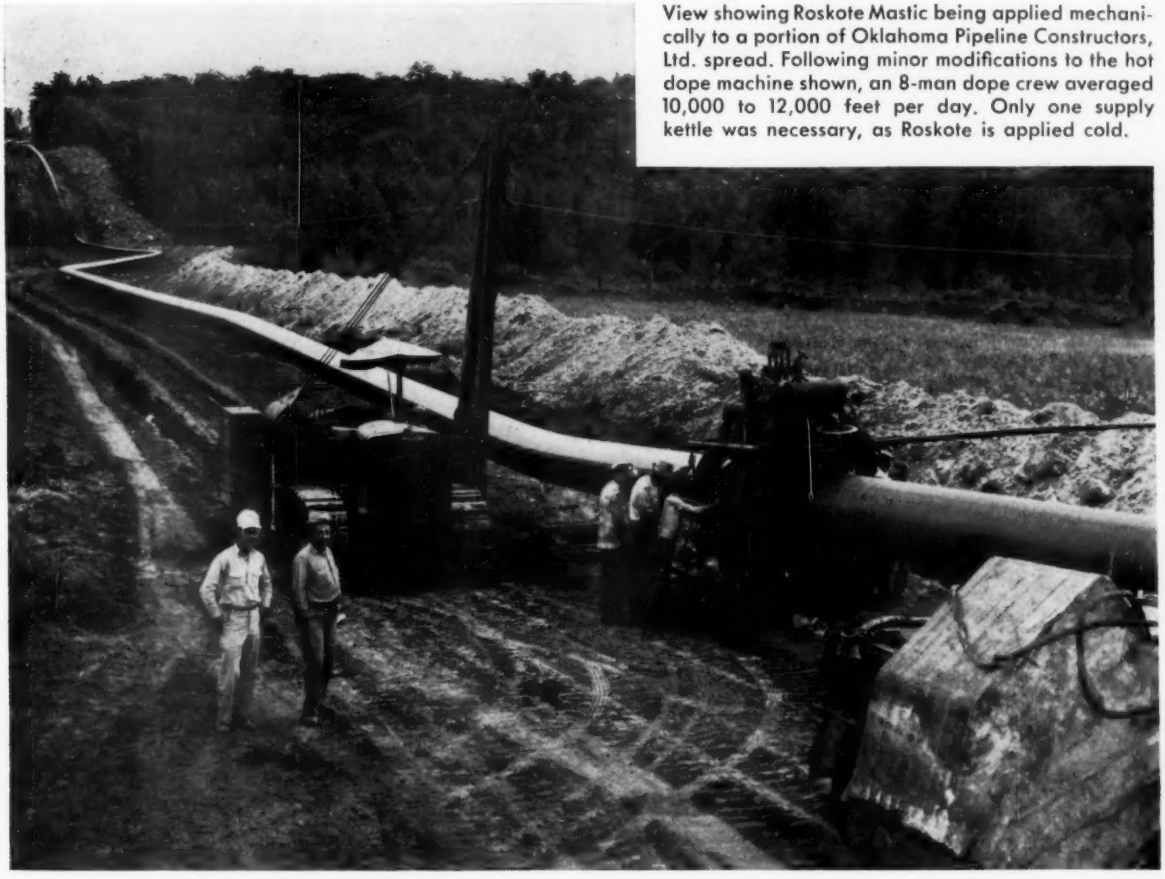
Generally the standard method for wrapping a field coating joint is to weld the pipe sections together and bevel off the asphalt wrapping. This is easily accomplished with a linoleum knife or a draw knife. The pipe is then wire-brushed and primed and the tape is applied with a 50 per cent overlap providing a double thickness of tape. An asbestos felt is then wrapped over the tape and held in place with friction tape. If the pipe is to be shoved in a bore, care is taken to wrap the felt up to the ends of the yard coating but no further. The ends of the felt are tied down with plastic tape as an added precaution. These procedures strengthen the field wrap against tearing and other damage during shoving.

We believe this type of field wrap gives us a better

TABLE 2. SPECIFICATIONS FOR PIPELINE MATERIALS

Pipe Coating Materials
ASPHALT

1. *Description*
This specification covers asphalt used for pipe coating.
2. *Applicable Specifications and Standards*
2.1 American Society for Testing Materials
(a) ASTM D92-52; Method of Test for Flash and Fire Points by Means of Cleveland Open Cup.
(b) ASTM D5-52; Method of Test for Penetration of Bituminous Materials.
3. *Requirements*
3.1 *Composition.* Air refined petroleum asphalt and inert mineral fillers.
3.2 *Flash Point.* ASTM D92-52, Cleveland Open Cup—475 degrees F minimum.
3.3 *Penetration.* Hundreths of a centimeter (Blunt Needle), 300 grams 77 degrees F, 10 minutes—maximum 12, minimum 8.
This test is made in accordance with ASTM D5-52 except that the needle is blunted by grinding off the tapered end. The blunt end will then be 1.00 to 1.02 mm in diameter. The grinding shall be done in a manner to produce a flat surface perpendicular to the axis of the needle.
3.4 *Filler*
3.4.1 *Type.* See specification for filler.
3.4.2 *Amount.* Not less than 10 per cent by weight (ash method — heat to 1800 degrees F).
4. *Preparation for Delivery.* The method of delivery will be specified by Purchasing. Possible methods are:
(a) 50-lb cartons
(b) 100-lb cartons
(c) 500-lb steel drums
(d) Hot delivery by tank truck
5. *Certification*
The supplier shall provide written certification that each shipment of asphalt meets the requirements of this specification and shall be prepared to furnish test results on request.
6. *Inspection*
The company reserves the right to take samples and make inspections of asphalt shipments. When a shipment does not meet the requirements, any portion that is in cartons or drums will be removed from company property by the vendor at his expense.



View showing Roskote Mastic being applied mechanically to a portion of Oklahoma Pipeline Constructors, Ltd. spread. Following minor modifications to the hot dope machine shown, an 8-man dope crew averaged 10,000 to 12,000 feet per day. Only one supply kettle was necessary, as Roskote is applied cold.

Roskote Applied Cold with Line Travel Equipment on Trans-Canada 30 Inch

Over rough terrain, with a right of way that crossed solid granite, muskeg, swamp and glacial till, and working under adverse weather conditions, the world's longest and most difficult pipeline construction — Trans-Canada Pipe Lines, Ltd. — has been completed.

One contributing factor in the success of this construction was the adaptation of standard line travel dope machines for the easy application of Roskote cold mastic. This combination of Roskote Mastic and modified line travel machines made possible the coating of ten to twelve thousand feet per day of 30-inch piping on the downstream side of the compressor stations.

Contractors* were able to carry on the coating operation with an 8-man dope crew, using only one supply kettle, requiring no heating fuel and thereby eliminating toxic fumes and fire hazard.

*Contractors on Trans-Canada who applied Roskote by line travel equipment:
Morrison-Shivers, Ltd., Majestic Contractors, Ltd.,
B. C. Rivers Construction, Ltd., Dutton-Williams Brothers, Ltd.
and Oklahoma Pipeline Constructors, Ltd.

ROYSTON LABORATORIES, Inc.
Blawnox, Pittsburgh 38, Pa.
A LEADER IN THE FIELD OF INDUSTRIAL COATINGS FOR CORROSION CONTROL
ATLANTA • CHICAGO • HOUSTON
PHILADELPHIA • SAN DIEGO • TULSA

G3

ROYSTON LABORATORIES, Inc.
Pittsburgh 38, Pa.

Please send me complete information about the economics and application of cold-applied Roskote Mastic with line travel equipment.

Name _____

Company _____

Address _____

City _____ Zone _____ State _____

TABLE 3. SPECIFICATIONS FOR PIPELINE MATERIALS

Pipe Coating Materials

PIPE COATINGS NOS. 67 and 69 FOR YARD WRAP ONLY

1. *Description*
This specification covers filled asphalt pipe coating with glass mat inner wrap and asbestos felt or Kraft paper outer wrap. It covers preparation of the pipe surface, designates which coating materials are to be used and applied, and standardizes inspection. The No. 67 coating is used on pipe sizes 8-in. and larger. The No. 69 coating is used on pipe sizes 6-in. and smaller.
2. *Applicable Specifications and Standards*
2.1 Company Specifications For:
(a) Primer
(b) Asphalt
(c) Asbestos Felt
(d) Kraft Paper
(e) Glass Mat
(f) Whitewash
3. *Pipe Surface*
3.1 *Cleaning.* Pipe surface shall be blasted with steel grit or shot to remove all corrosion products and loose or tight mill scale. The grey oxide binder between scale and steel need not be removed.
3.2 *Heating.* Pipe shall be heated to a temperature of 180 degrees F or higher immediately before coating.
When heating to 180 degrees F is not feasible, the pipe may be heated to at least 120 degrees F, primed with an asphalt primer and coated at any time during the same day.
4. *Coating*
4.1 Materials. The coatings consist of the following materials:
4.1.1 *No. 67 Coating*
(a) One coat of asphalt
(b) One spiral wrap of glass mat
(c) Second coat of asphalt
(d) Spiral wrap of asbestos felt
(e) Coat of whitewash
4.1.2 *No. 69 Coating*
(a) One coat of asphalt
(b) One spiral wrap of glass mat
(c) Second coat of asphalt
(d) Spiral wrap of Kraft paper
(e) Coat of whitewash
4.2 *Position of Glass Mat.* The glass mat shall be approximately in the middle of the asphalt coating.
4.3 *Coating Kraft Paper.* The Kraft paper shall be coated with hot asphalt as it is unwound from the roll and applied to the pipe. This strengthens the coating and prevents cracking at the helix of the paper wrap in storage.
4.4 *Thickness*
4.4.1 *Pipe Size 2-In. and Larger.* The total thickness shall be not less than 0.180-in. or more than 0.210-in.
4.4.2 *Pipe Sizes Smaller than 2-In.* The total thickness shall be not less than 0.170-in. or more than 0.200-in.
4.4.3 *Measurement of Thickness.* Measurement is made at any point on the coating.
4.5 *Amount of Overlap.* The overlap of the spiral wrap of glass mat, felt and paper shall not be less than ¼-in. or more than 1-in.
4.6 *Composition of Whitewash.* The whitewash shall be made of slaked lime and water.
4.7 *Coating Ends.* The ends of the coating shall be cut square at an angle of 90 degrees with the pipe. The ends of the coating shall be 9 in. ±1 in. from the end of the pipe.
4.8 *Inspection for Holidays.* All coating shall be inspected for holidays with a jump-spark detector before it is issued from the wrapping yard. Holidays should be patched or the coating stripped off and the pipe rewrapped depending on which is the lower cost.

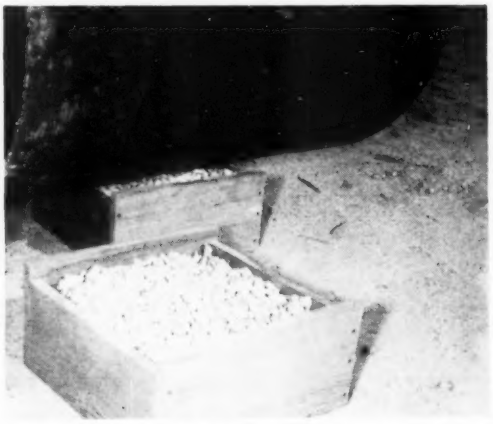
job than the old method using hot asphalt, and the field crews prefer it.

Service tees also are wrapped with tape and here again a better coating job is obtained than was formerly possible with hot asphalt. However, so much time is required to make the wrap that several other materials are now being considered.

• Field testing of coating

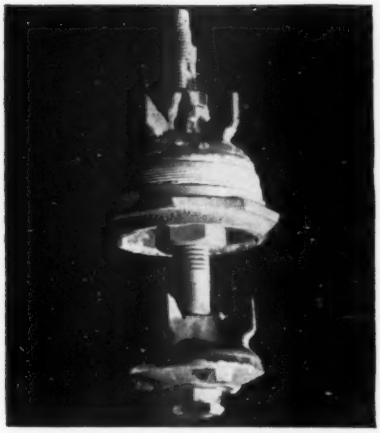
When the pipe is delivered to the job it usually is in good condition since it was "jeeped" after it was coated and considerable care was used in handling and storing. Even with these precautions, however, damage can occur to the coatings and on more important pipelines the coating is again jeeped just prior to installation. The smaller lines are visually inspected and may be jeeped if this appears desirable.

Care is taken with installation and backfill, but here again the coating may be damaged. As a quality control measure, Pearson detector tests are occasionally made to "spot check" the coating for holidays. Company inspectors are on every job and they are very much aware of the necessity for having good coatings. If the inspector considers it necessary, the coating on any particular job may be completely tested with a Pearson detector after backfilling.

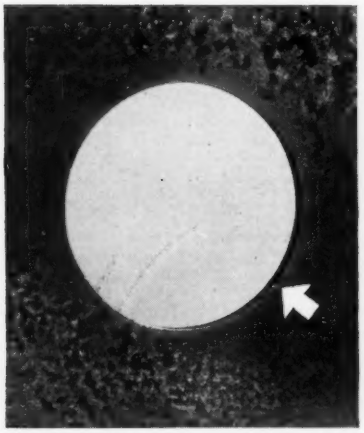


Rock penetration test of coating. Three-foot length of 30-in. pipe filled with water weighs 1500 lb.

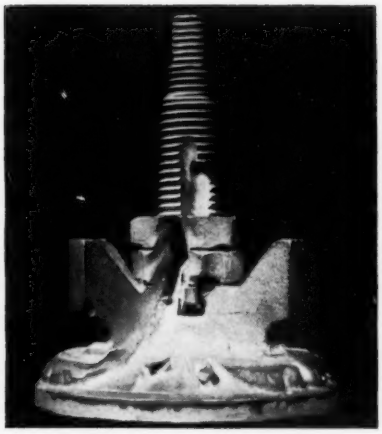
Loading wrapped pipe by means of end slings.



Pressure control lost with this dust-eroded regulator valve part

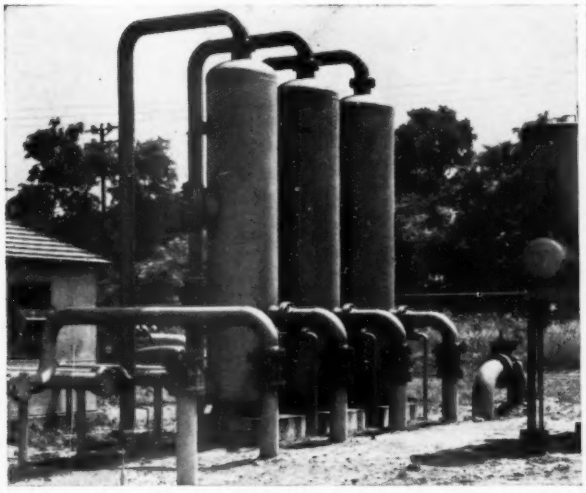


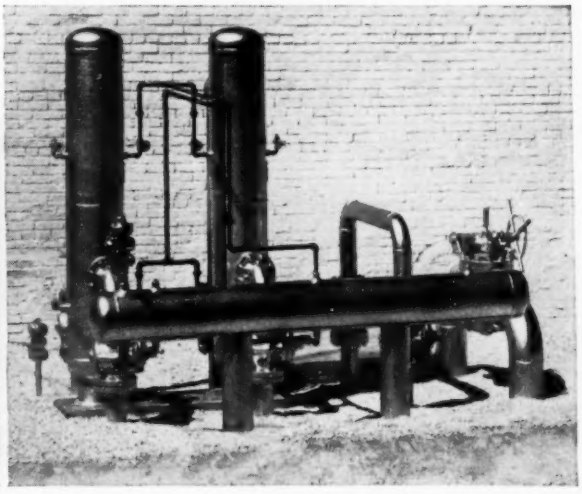
Edge nicked and rounded on this flat plate orifice—caused by dirty gas



Sand-blast erosion by pipe line dust ruins this inner valve

all dust damage prevented with Blaw-Knox Gas Cleaners





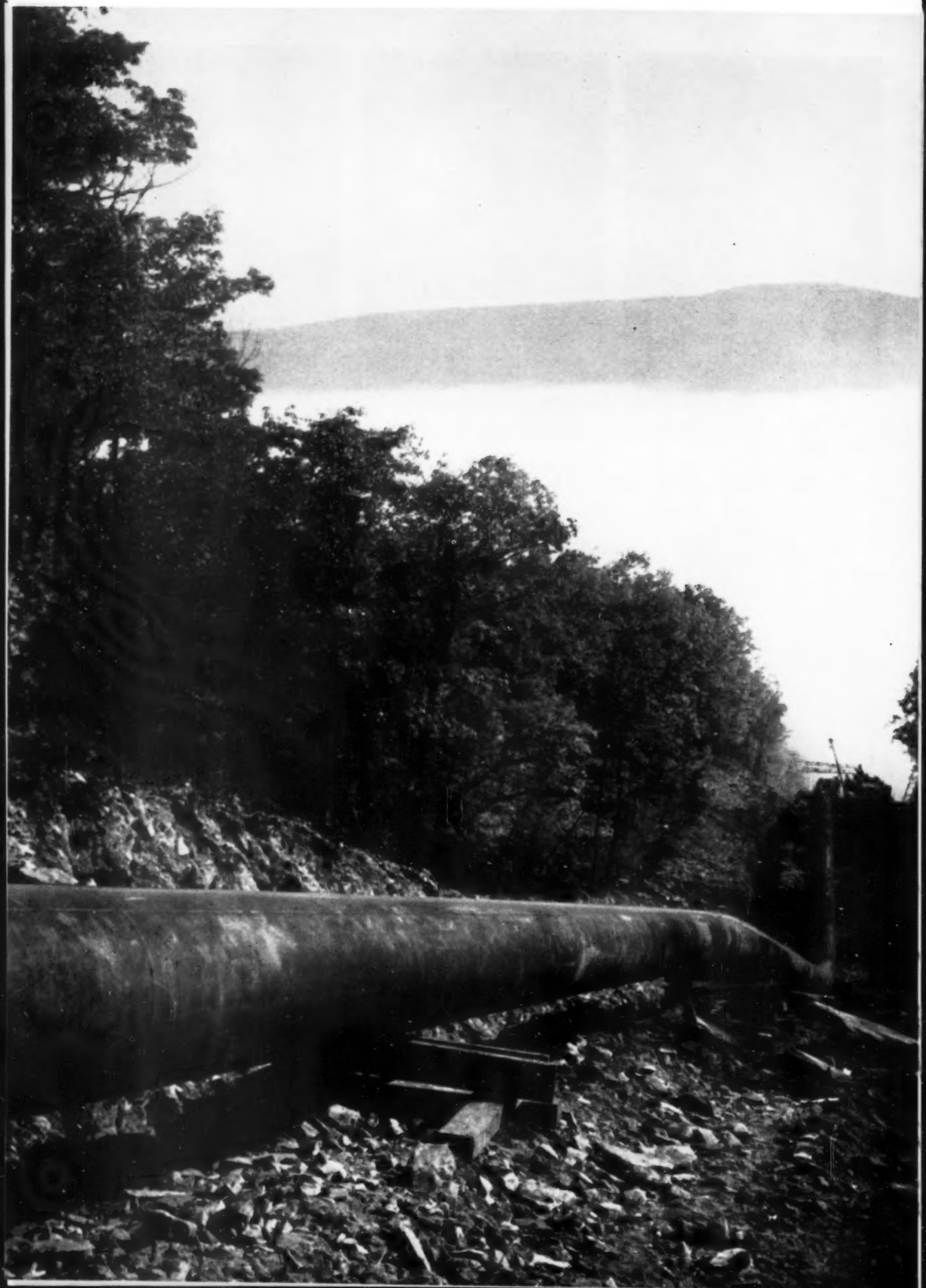
Mill scale, construction dirt, well sand and corrosion products are always present in gas lines whether visible or not. But *invisible* dust has the greatest damaging power. These micron-sized particles (20 microns or 0.00078″ and under) travel the farthest to sand blast regulators and other metering devices. They even drift into household appliances causing pilot outages.

That's why it pays to use a gas cleaner that traps and retains even microscopic dust. Blaw-Knox Gas Cleaners take the guesswork out of complete cleaning. Operating on the oil scrubbing principle—the only known way to remove *all* the dust—Blaw-Knox cleaners provide trouble-free fuel that cuts your operating costs, maintains highest customer relations.

Bulletin 2450 shows how Blaw-Knox Gas Cleaners pay for themselves at compressor stations, town boarder stations and district regulators, and it presents a simplified way to select the right size cleaner for your requirements. Send for your copy today.

BLAW-KNOX

BLAW-KNOX COMPANY
Buflovak Equipment Division
1547 Fillmore Avenue, Buffalo 11, New York



Near the line's western terminus, at an altitude of 2700 ft, crews are shown actually laying pipe down into a cloud bank.

There was rough terrain along the entire route of the Leidy Line. Grades of 40 pct and more were frequently encountered.

Contractor for Spread A, 65.53 mi, was Sharman, Allen, Gay & Taylor, Inc.; contractor for Spreads B (45.98 mi) and C (52.33 mi) was Panama-Williams Corp.

Working above the clouds on Transco's high-test line

There's some mighty rugged country in Pennsylvania, none of it tougher for pipe laying than along the route of Transco's Leidy Line. There, in the northern and eastern sections of the state, the Appalachian Mountains thrust their sharp ridges high above the valleys. For crews laying 24-in. Bethlehem line pipe, this meant working on severe grades, frequently up to 40 pct, and at altitudes ranging from 900 to 2700 ft. There's hardly a level stretch on the entire 164-mile length of the line. In addition, there are numerous crossings of rivers, streams, highways, and railroad rights-of-way.

Completed in December, the Leidy Line connects Transco's main line (McAllen, Texas, to New York City) with a newly developed storage field near Renovo, Pa. There, worked-out gas wells provide underground storage capacity. This functions as a "bank" where Transco customers can deposit gas during slack periods for withdrawal to supply peak load requirements.

All of the API pipe laid from the Delaware River to the storage field was supplied by Bethlehem from our Steelton, Pa., fabricated pipe shop.

Line Pipe to 42 in. OD. At Steelton we are equipped to produce API pipe, hydraulically expanded, in all diameters from 18 in. to 42 in. OD, the latter with walls to ¾ in. Electric resistance-weld pipe from 5½-in. to 16-in. OD, and continuous buttweld pipe from ½-in. to 4-in., nominal, are produced to standard API line pipe specifications on our Sparrows Point, Md., pipe mills.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

TABLE 4. UNDERGROUND LEAK INSPECTION

Division .....
District .....
Year Pipe Installed.....
Main, or .....
Service .....

Soil Type		*Coating Material*	
AA	.....	Asphalt	.....
A	.....	Grease	.....
B	.....	Plastic Tape	.....
C	.....	Other	.....
D	.....		
Unknown	.....		

Wrap		*Cathodic Protection*	
Yard Wrap	.....	Yes	.....
Field Wrap	.....	No	.....
Bare Pipe	.....		

- **Evaluating performance of coatings in service**

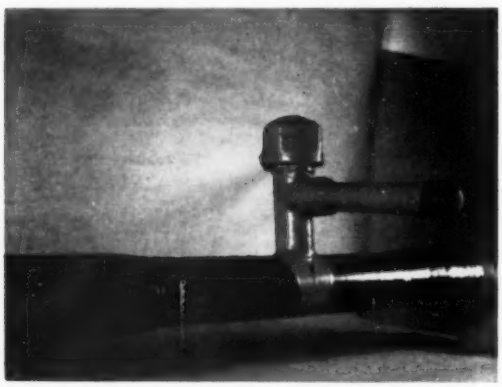
When an underground corrosion leak in steel pipe is repaired among other data the information listed in *Table 4* is recorded.

This information is punched on IBM cards and totalized. This is a new procedure in our company and has not been in operation long enough to evaluate the results. We expect that this will give us valuable statistical data on corrosion leaks, coating performance and cathodic protection.

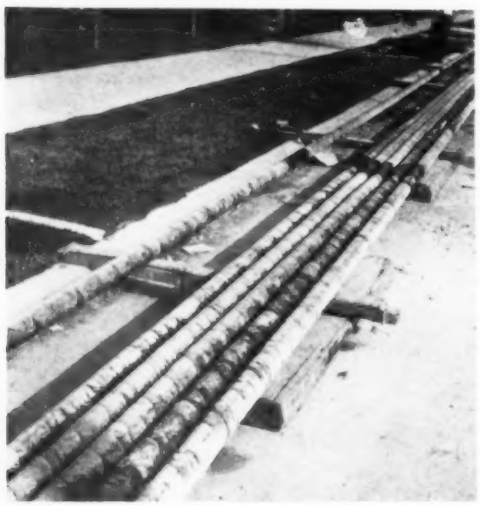
In addition to leak repair work, visual inspections are made of the coating. Inspections are made on a periodic basis for high-pressure lines and the coating is examined whenever it is exposed. Records are also kept of the amount of current required for cathodic protection and this gives an indication of the performance of the coating.

Special investigations of coatings are made in areas where new materials are used. For example, our first plastic tape coatings on field joints were made several years ago in housing tracts and we have been looking at a few of these each year. Inspections are also made of several other types of coatings which have been installed on an experimental basis. These supplement our laboratory tests and provide operating data on these new coatings.

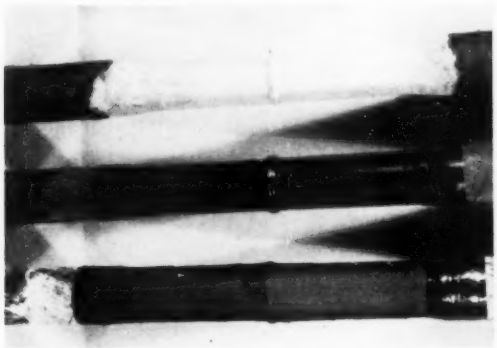
We hope that these investigations will enable us to improve our materials and methods and, at the same time, furnish information with which we can determine the most economical method to achieve corrosion control. ■



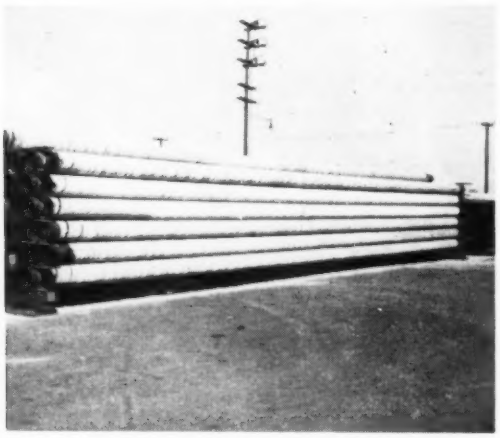
Plastic tape wrap over a service connection. Gray tape on tee is more flexible than black tape on main.



Used firehose makes a good skid padding for small pipe.



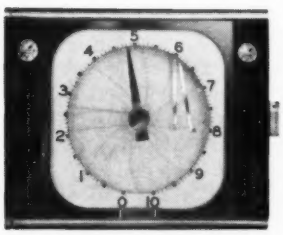
Field coating joint on pipe that is to be shoved through a bore. Top: yard coating ends tapered and primer applied; center: spiral wrap of plastic tape, 50 per cent overlap; bottom: felt outerwrap. Ends tied down with plastic tape.



Wrapped pipe in stockpile supported on uncoated ends.

Bristol's 7-point coast-to-coast field service

Helps you from the time you start thinking instruments – through installation – for as long as the job requires



A Bristol Field Engineer is the man to call when you first start thinking about instrumentation. Located in a nearby Bristol office (they blanket the U.S. and Canada) he calls at your plant to assist you in planning your proposed installation. No obligation.

Application Engineers, specialists in the abilities and limitations of every type of instrument, and Process Specialists, experts in instrumentation techniques in varied fields can be called in where necessary. They insure you the right instrument, installation and operation for your specific job.

Service Engineers to keep your instruments operating perfectly are "on call" often within a few hours. They install, check and adjust instruments in your plant.

Periodic Check-up Service at regular intervals is also available.

Bristol's Instrumentation Schools for customer engineers help train your own technicians in instrument operation and maintenance.

Factory Repair Service at San Francisco, Los Angeles, Chicago, Houston, Waterbury and Toronto has all facilities, parts, experience to properly repair, recondition and remodel Bristol instruments. Each instrument reconditioned carries a new instrument warranty.

Fast Parts Service is assured by the Bristol practice of stocking service parts that may be needed in emergencies in all 38 Branch offices. You get fast action from a near-by source.

These big extras you get with Bristol instruments are good reasons–over and above outstanding basic instrument quality–why every Bristol installation gives such high accuracy and precision performance over an extremely long service life. To find out more about Bristol instruments or service, write: The Bristol Company, 119 Bristol Road, Waterbury 20, Conn. B-17

BRISTOL TRAIL-BLAZERS IN PROCESS AUTOMATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Edited by FRANK CHAPMAN

A new method of pipeline communications

By F. VINTON LONG

A MEANS of good reliable effective communications is the use of buried metallic coaxial transmission line.

Right here the dyed-in-the-wool communications man is going to swallow his pipe and say "Preposterous, what is this man thinking of?" This has happened with my own staff!

And the old timer like me will say, "I thought of using a buried wire long ago, but it won't work in practice." Or maybe like the Englishman, "We tried it once and didn't like it."

But I say that this thinking is now wrong: Times have changed; so have requirements and materials.

Let's list all the reasons why it won't work:

1. No channel space. A very limited amount of channels available.

My comment on that is to carefully study *Fig. 1.* You will see that sufficient band-width without excessive attenuation is available to satisfy any normal pipeline need.

2. Too many unattended repeaters strung out along the right-of-way. Just look at the common carriers and how they amplify every few miles.

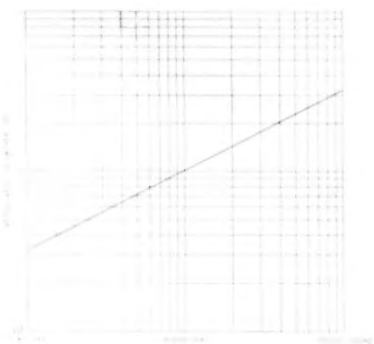


Fig. 1

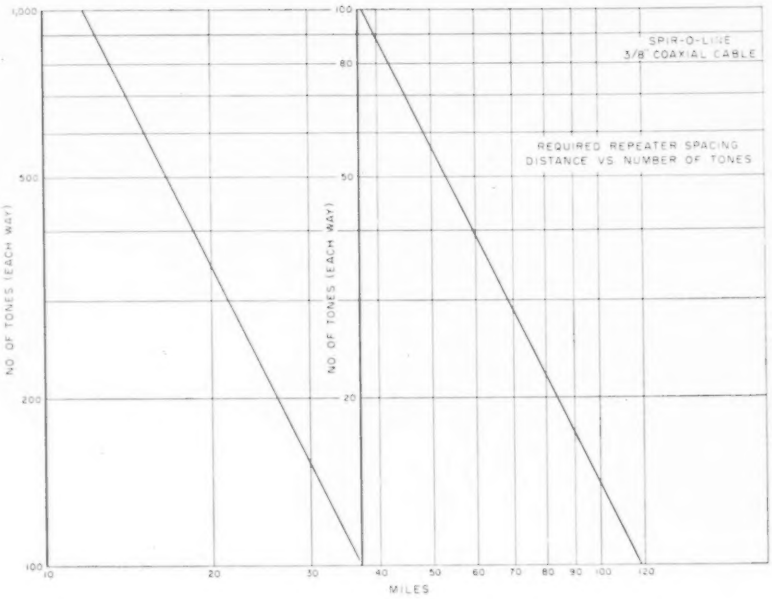


Fig. 2

My comment on that is to again look at the graph. In many cases you will require no repeaters between terminals, as the graph shows that you have little line loss for many miles if a minimum of audio channels is used.

The common carrier requirements are entirely different from the requirements of pipeline companies. Either they use multi-pair cables for low density, or large coaxial lines with enormous band width for many circuits or TV.

3. Supposing the pipeline blows up?

So what? We will replace a piece of cable if it's damaged. And how often do they blow up? And if they do, you close down shop anyway, and your repair crews are all equipped with VHF mobile units.

4. It is easily damaged.

Not if plowed in or laid with the pipe. And this method has no monopoly on damage risk. But if it is damaged, it is easily detected and located by proper equipment.

5. It will be hard to maintain.

It will be simple because of the absence of many repeaters. It uses no RF equipment, and there are no RF-path fading problems to contend with, but where repeaters are necessary, transmission at relatively low frequencies over co-ax allows for the installation of transistorized terminal equipment of superior dependability.

6. It will cost too much.

When the firm control of a multi-million dollar pipeline depends on its communication links, management had better not shy off a sometimes higher initial investment if it will provide trouble-free, reliable

TO MARK PROGRESS

LADISH

Controlled Quality

LIGHT WEIGHT WELDING FITTINGS

developed for economical, dependable low pressure piping systems

LOWER COST

Substantial savings realized in purchase price of fittings and pipe.

REDUCED WEIGHT

Important weight reductions achieved by reducing wall thickness to correspond with service requirements.

GREATER FLOW

Larger inside diameter provides increased flow capacity.

EASE OF INSTALLATION

Reduced weight facilitates handling . . . speeds installation.

AVAILABILITY

Stocked in sizes 4" through 24". Wall thicknesses range from .188" to .250".

CONFORMITY TO SPECIFICATIONS

These fittings meet all requirements of ASA Code for Pressure Piping B31.1—1955 and B31.1.8—1955, ASTM A234 and ASA B16.9.

Lower purchase cost . . . reduction in weight . . . economy and ease in installation . . . increase in flow capacity—these are multiple advantages gained in using Ladish Light Weight Seamless Welding Fittings.

These Light Weight Fittings have been developed and produced under rigid metallurgical and manufacturing standards as part of a continuing program to meet the specific needs of industry for economical, functionally designed fittings.

Specification sheets on Light Weight Welding Fittings and Flanges available on request.

TO MARK PROGRESS

LADISH CO.

CUDAHY (Milwaukee Suburb) WISCONSIN

SALES OFFICES: Amarillo • Atlanta • Baton Rouge • Buffalo • Calgary Chicago • Cincinnati • Cleveland • Denver • Havana • Houston • Los Angeles Mexico City • Montreal • New York • Odessa • Philadelphia • Pittsburgh St. Louis • St. Paul • San Diego • San Francisco • Seattle • Toronto • Tulsa

SAW BLADES • PIPE FITTINGS • DROP FORGINGS • RINGS • VALVES

LADISH...THE FITTINGS LINE THAT OFFERS COMPLETE SERVICE IN TYPES, SIZES AND MATERIAL SPECIFICATIONS

WELDING FITTINGS	ASA & MSS FLANGES	SCREWED & SOCKET FITTINGS & UNIONS	LONG NECKS	LARGE DIAMETER & T.E.M.A. FLANGES

operation. And if maintenance costs on a long-term basis are studied, this plan will often be as cheap as microwave.

And further, initial cost may not be higher than a good microwave system.

Actual cost will vary considerably, but I believe that we can expect a $\frac{3}{8}$-in. coaxial line to cost from $1500 to $2000 per mile, and about $500 to $1000 per mile to drop it in the pipeline ditch or plow it in with a conventional telephone cable plow.

This is not too far from a good microwave system cost per mile.

How far can you communicate? No limit with good repeaters. How often must you have repeaters? Not very often, as *Fig. 2* shows. It all depends on the band width required. Since the important requirement for this type of service and reliability is for pipeline telecontrol and not for voice communication, a minimum of voice circuits will ordinarily be used and you can carry a lot of telemetering and control intelligence on a rather narrow band width.

To present an example of channels and tones available, tone control, with guard band, was allocated 200 cycles each; and voice channel, including guard band, was allocated 4000 cycles each as the average band width required. The value of 40 db was considered as the allowable drop in signal without noise or cross-talk interfering with the received signal. At this rate, you could obtain 40 control tones plus 2 voice channels in each direction with a repeater spacing of about 40 miles. Or if you do not use voice and want to get along without repeaters between compressor or pump stations, 50 tones with 50-mile spacing, or 25 tones with 75-mile spacing.

Once we take cognizance of the fact that in the pipeline business we don't need great numbers of voice channels, and since we don't need these channels, we don't need closely spaced repeaters, and that coaxial lines will operate better at audio frequencies than they do transmitting RF such as TV, the whole idea becomes so simple that we wonder why we haven't done it before!

The case rests. ■

GAS • PIPELINE NEWS

Gulf Interstate becomes Columbia Gulf

The line that was constructed in 1954 for the sole purpose of carrying gas bought by Columbia Gas System to an affiliate has now become part of the Columbia system.

Now called Columbia Gulf Transmission Co., Gulf Interstate had operated as an independent, nonaffiliated company, transporting Louisiana gas to United Fuel Gas Co. of Charleston, W. Va., principal supplier to other companies in the Columbia system.

The $200 million, 850-mile line was acquired for common shares of Columbia Gas System and the assumption by Columbia Gulf Transmission of Gulf Interstate debt of $142 million.

George S. Young, president of Columbia, said "Columbia has acquired this pipeline in order to assure its wholesale and retail customers that sufficient supplies of Southwest gas will be available in sufficient quantities to meet all demands upon the system."

Capacity of the line which runs from Rayne, La., to Leach station, Ky., was 375 MMcf per day when it became operative in November 1954. New construction since then has raised the daily capacity to 666 MMcf.

Seeking review of Transco authorization

The U. S. Court of Appeals for the third circuit has been asked to review an FPC order authorizing natural gas sales to Transcontinental Gas Pipe Line Corp., Houston.

United Gas Improvement Co. and Philadelphia Electric Co. filed a joint petition. The New York Public Service Commission filed separately.

The petitions seek review of an FPC opinion (No. 315) authorizing Transco to expand its system (Dockets G-13143, et al), and authorizing 26 independent producers to sell gas to Transco from southern Louisiana (Dockets G-13169, et al).

Among other things, the petitioners claim the commission failed to inquire into the reasonableness of the proposed prices or to provide any protection against their unreasonableness; that the evidence was insufficient to support the issuance of certificates at the proposed initial prices; and that price conditioned certificates should have been issued notwithstanding customer agreements to pipeline price increases, the necessity for FPC approval of other producer rate increases triggered by this one, questions as to the sufficiency of field price evidence to support price conditions, possibility of withdrawal of gas from the interstate market, and the asserted effect to be given the producers' sale contracts under the Supreme Court decision in Mobile and the 10th Circuit in Phillips.

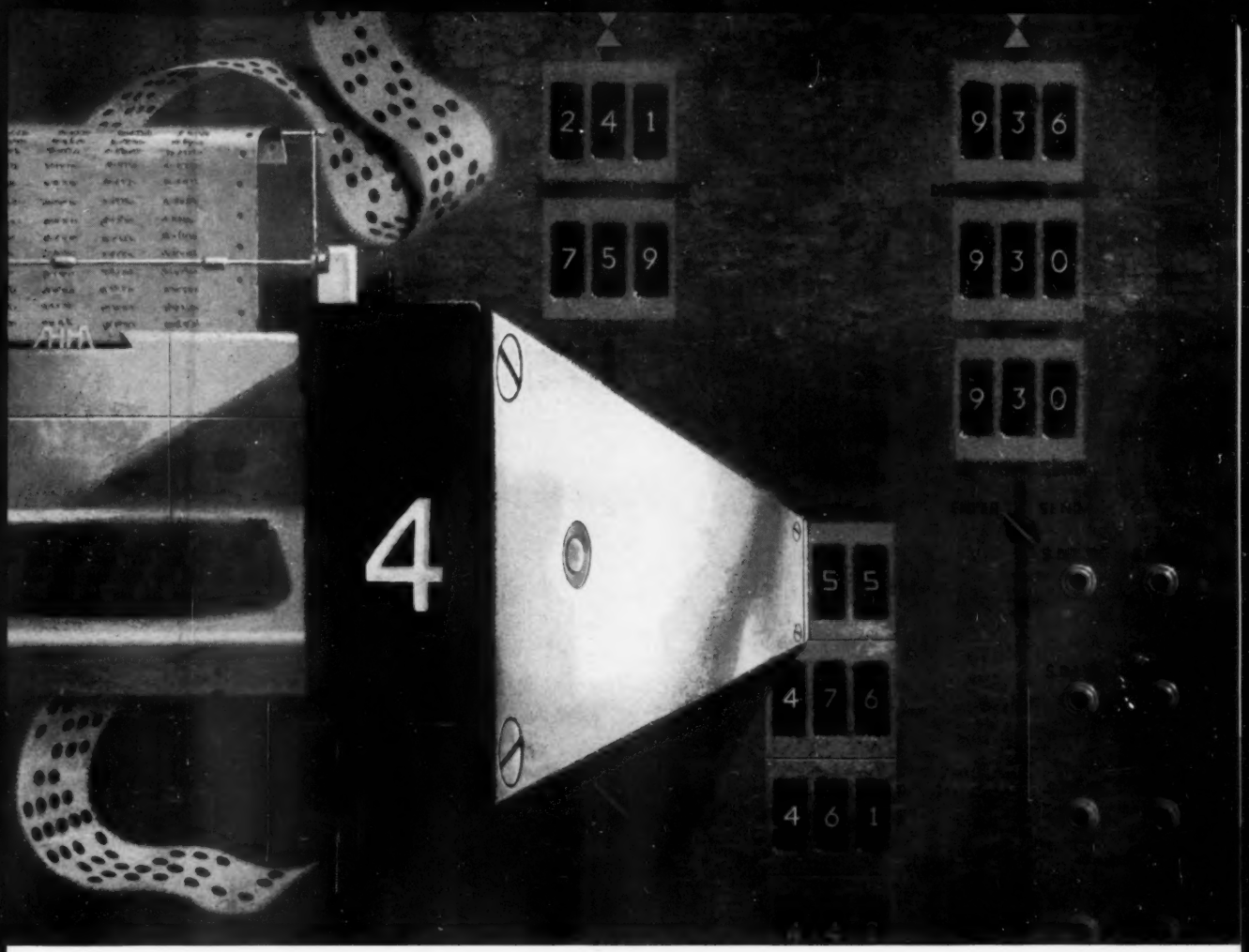
Michigan's new tariff plan suspended by FPC

FPC has suspended a new natural gas tariff filed by Michigan Wisconsin Pipe Line Co. to substitute a demand-commodity form of rate for the straight commodity form which has been in effect since the company began operations.

Although Michigan Wisconsin had requested an effective date of Jan. 15, the FPC said the revised tariff by its own terms provided that the two-part rate would not become effective until April 1. Until that time, the company proposed to continue its present 37.5-cent per Mcf rate, which is being collected subject to refund in another suspension proceeding. The FPC thus suspended the interim rate for one day—until Jan. 16, when it could be put into effect subject to refund, and suspended the proposed two-part rate for five months from April 1.

This filing was made on Nov. 19. Previously, Michigan Wisconsin filed for a proposed two-part rate last summer. But this was rejected as incomplete.

The proposed new tariff would affect 21 wholesale customers in Illinois, Iowa, Michigan, Minnesota, Missouri, and Wisconsin. The FPC noted that while the two-part rate is proposed to become effective April 1, the maximum average rate through Aug. 31 would be the 37.5-cent rate, the same as is now being collected subject to refund.



NEW CONTROL CONCEPT
can cut your pipeline costs

Did you ever try to solve a jigsaw puzzle without first looking at the total picture the puzzle makes? Pretty difficult—maybe even impossible. Best way, easiest way is to look at the big picture first, then see where the individual pieces fit.

It's the same with pipeline control.

First, look at your total system problem. Then, determine what sort of control system is required to safely, reliably and economically meet tomorrow's need as well as today's. That is Union Switch & Signal's approach to pipeline control.

Any part of a pipeline system. Union Switch & Signal can incorporate in a centralized control system any or all of the following functions: supervisory or remote control of satellite stations . . . telemetering of flow data from field back to your central dispatching office . . . automatic sequencing or control of equipment in the field . . . instrumentation . . . data handling and display . . . computing equipment . . . automatic integration of field data into your accounting operations . . . communications. Union Centralized Transport Control can be adapted to *any* problem from remote control of a single-unit booster station for gas or oil to automatic centralized control of an entire system from wellhead to ultimate consumer.

Error-free. Whatever the job assigned to it, Union Centralized Control operates completely free from error because it reduces to coded digital form all information and instructions transmitted to or from your central control office. As a result, you can transmit far more precise data than ever before; you can use the least expensive available communications service; and you never need to worry about lightning, noise or other interference causing a wrong or dangerous operation—this coded system automatically checks itself and responds *only* to correct and logical signals. It helps make your pipeline safer. It provides error-free *security* as well as reliability.

Lower operating cost. Most important, Union Centralized Transport Control cuts your operating costs, cuts the cost of future expansion, sometimes even cuts present installation cost of pumping stations.

Write for Bulletins PD 2006, PD 2007 and 1052

See us at PESA—Galveston, April 7-9. Booth 18-20-22 • IPE—Tulsa, May 14-23. Sec. R-Oklahoma Drive

"Pioneers in Push-Button Science"

UNION SWITCH & SIGNAL
DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY
PITTSBURGH 18, PENNSYLVANIA

Mississippi must supply Illinois, Missouri towns

Mississippi River Fuel Corp., St. Louis, has been told to supply gas to four communities in Illinois and to change the character of deliveries to a distributing company in Missouri in order to eliminate over-run penalties (Dockets G-14857, G-15189, and G-16398).

The FPC presiding examiner's decision orders Mississippi to supply gas to Illinois Power Co., Decatur, Ill., for delivery to O'Fallon, Millstadt, and Hamel, Ill.; to make deliveries to the City of Chester, Ill.; and to increase its deliveries to the St. Charles (Mo.) Gas Corp. Maximum deliveries sought for all five of these communities would total approximately 4 MMcf per day.

Mississippi opposed the Illinois Power and Chester applications, but did not object to the change for St. Charles. This change would raise St. Charles' stated demand from 2 MMcf to 2.3 MMcf daily to enable it to avoid payment of overrun penalties.

Mississippi contended that while the connection of the proposed new loads would not create a problem with respect to annual volumes, there might be adverse effects on a peak day.

Third year peak-day deliveries would total 2.2 MMcf to Illinois Power and 1.5 MMcf to the City of Chester.

Michigan gets okay on $31 million job

Temporary authorization was granted Michigan Wisconsin Pipe Line Co. to spend $31.1 million on 352.9 miles of 24-in. pipeline loops and 16,560 hp in additional compressor capacity (Docket G-13246).

The proposed facilities, to be built in Kansas, Missouri, Iowa, Illinois, and Michigan, are in lieu of nine intermediate mainline compressor stations okayed by the FPC in June 1958.

The early facilities were to enable Michigan Wisconsin to take 40 MMcf daily from the Laverne field in Harper county, Okla., and to transport it through its mainline system. Michigan Wisconsin said the facilities it has already constructed under the FPC authorization are enough to enable it to move 80 MMcf daily from the field to the mainline.

The modified construction, the company said, would enable its system to transport an additional 40 MMcf per day. Michigan Wisconsin said it now has under contract in the Laverne field an aggregate of 631.2 billion cu ft of recoverable reserves, which, it said, permit the increased takes.

The FPC said the temporary authorization is without prejudice to such final disposition as the record may require and to the ultimate disposition of the company's application to construct 20.9 miles of 16-in. line and add 5820 compressor hp, all in Wisconsin, at a cost of about $2.8 million. This other application (Docket G-16998) proposes the sale of the additional 40 MMcf per day to the existing customers in Michigan and Wisconsin.

End of exchange agreement okayed

An exchange agreement between Panhandle Eastern Pipe Line Co., Kansas City, Mo., and Cities Service Gas Co., Oklahoma City, can be terminated (Dockets G-16187 et al).

FPC presiding examiner Harry W. Frazee, however, required Panhandle to continue furnishing Gas Service Co., Kansas City, with a volume of natural gas equal to the capacity of Panhandle's Louisburg lateral. He determined the capacity of this line to be 15.4 MMcf daily.

Under the agreement, Cities delivered gas to Panhandle in Jackson county and Johnson county, Mo. Panhandle returned an equal volume to Cities in Johnson county. Gas Service Co. receives maximum volumes of 15.4 MMcf daily from Panhandle and 8.2 MMcf from Cities. The latter volume is transported by Panhandle.

The examiner said the record shows that Cities is now able to deliver its volume directly to Gas Service and there is no further need for the emergency exchange agreement. Cities Service, he declared, assumed the untenable position of arguing that it is not willing to deliver its quantity of gas directly to Gas Service Co. and yet is willing to deliver this volume, and more, to Panhandle under the exchange for immediate delivery to Gas Service.

Cities Service was authorized to construct 10 miles of 20-in. line looping a section of 12-in. on its Ottawa-Sedalia system. Cities said the construction was needed to meet needs of existing customers. Panhandle was authorized to build 6.5 miles of 4-in. line and a regulator station. Cities cost: $349,200. Panhandle's: $116,700.

Houston Natural completes new 26-mile line

Houston (Texas) Natural Gas Corp. has completed its 26-mile, 18-in. line between Odem and the company's main transmission line at Sweeny Switch in Live Oak county. Houston Pipe Line Co., a subsidiary, built the line.

Upon completion of the $1.5 million line, the company said construction will begin immediately on a new $2 million line from Sweeny Switch through fields in Live Oak and McMullen counties. It will cover 43 miles of main transmission lines and 15 miles of lateral gathering lines.

"The ability of our company to bring an abundant gas supply to Corpus Christi from many gas fields and seven different directions will give our customers a uniform and reliable supply of gas during the most critical winter peak periods," vice president Joseph F. Wolff said.

Joining of Houston Natural's 500 miles of transmission and distribution lines in the Corpus Christi area with 1300 miles of Houston Pipe Line system facilities will give local access to gas supply sources in 88 producing fields from 21 Gulf Coast counties.

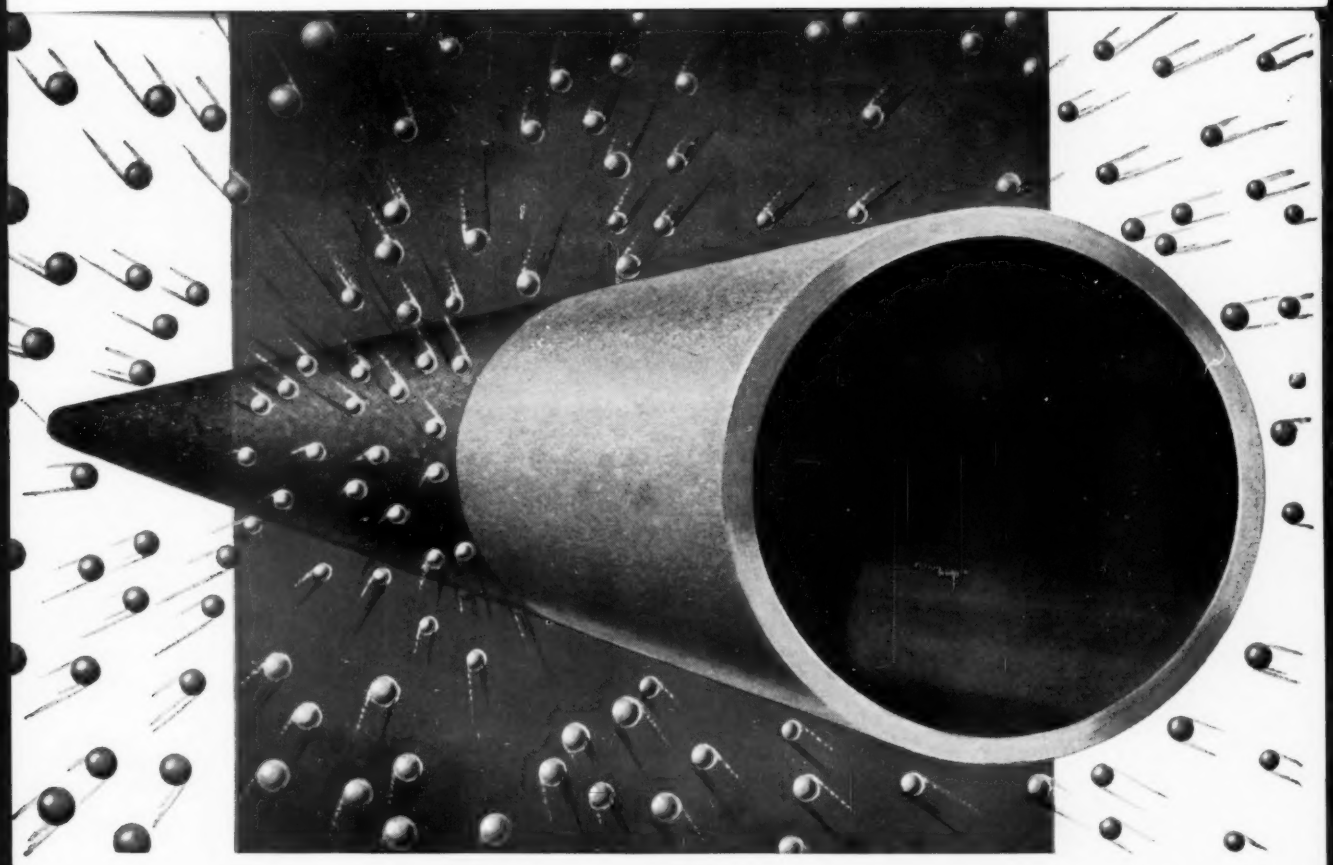
Major expansion planned by Northern Natural

Facilities needed to add 326 new communities to its system and to cost some $101 million are covered in two applications Northern Natural Gas Co. recently filed with the FPC.

Of the 326 communities, 170 are in Iowa, 119 in Minnesota, 17 in South Dakota, 12 in Nebraska, 7 in Wisconsin, and 1 in Illinois. Late last year Northern said it would file these new applications after the FPC denied service to 208 of the communities on the grounds that Northern's Redfield, Iowa, underground storage area was not sufficiently proven.

While Northern is continuing with its storage project at Redfield and hopes to prove that the project is workable, gas reserves for the new proposals will come from supplies in the Southwest.

Covered in the filings are 217 miles of mainline extension, 221 miles of mainline loops, and 1906 miles of branch lines. The projects



Steel Shot Cleaning makes Pipe Protection Stay Put

Applying protective coatings to improperly prepared pipe surface makes about as much sense as building a skyscraper on sand. Pipe Line Service has always pioneered in developing new ways to insure a good bond . . . a bond that makes protective coatings practically inseparable from the pipe itself.

An outstanding example is steel shot cleaning. Special machines permit bombardment of the pipe surface with millions of steel pellets traveling at high speed. Result? Not simply removal of mill scale and rust . . . but actually an "etching" of the steel surface. This slightly roughened surface allows the protective coating to "take root"—gives you the years of protection that you should have.

We emphasize Pipe Line's steel shot cleaning process because it was one of the great steps forward in maximum protection of *your* pipe investment. It's a manufacturing extra that's provided at no extra cost . . . and one more reason for extra confidence in specifying protection by PLS!

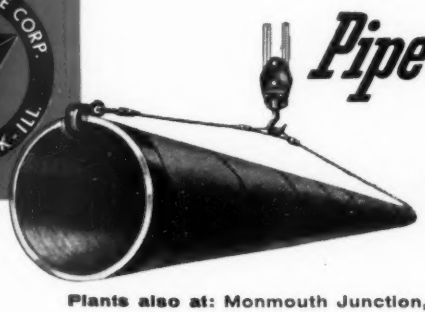
PIPE LINE SERVICE CORP. SERVICE EQUIPMENT MATERIALS FRANKLIN PARK - ILL.

A SUBSIDIARY OF AMERICAN STEEL FOUNDRIES

Pipe Line Service Corporation

General Offices and Plant: Franklin Park, Ill.

Quality pioneers in coating and wrapping pipe for over a quarter century



Plants also at: Monmouth Junction, N. J.; Glenwillard, Pa.; Sparrows Point, Md.; Longview, Tex.; Corpus Christi, Tex.; Provo, Utah; Harvey, La.

Sales offices at all plant locations . . . and Atlanta, Ga.; Dallas, Tex.; Houston, Tex.; Lincoln, Nebr.

call for construction of new compressor stations at Waterloo, Iowa, and Farmington, Minn. In both applications, Northern requests permission to build the facilities over a three-year period. It wants to build facilities to bring gas service to all 326 communities the first year and add additional facilities the second and third years to make more gas available to the communities.

When the program is approved, Northern will be serving 713 communities in seven states.

The first application includes an extension of Northern's system from the Twin Cities to Duluth, Minn., and Superior, Wis. Service to 39 areas is proposed here and will require a boost in daily system capacity of 52.5 MMcf over a three-year period. Estimated cost of this phase: $25 million.

In the second application, Northern wants to build facilities to serve 287 communities. This will require an increase in daily system capacity of 164.5 MMcf over a three-year period. Estimated cost of this project: $76 million.

Flow computer checking meter run in Canada

What is believed to be the first electronic flow computer of its kind in Canada is being used by North Canadian Oils Ltd. at a gas meter station in Hinton, Alberta. The flow measurements system used in the 30-day test is made by Computers Inc. of Houston.

The computer system was checked by two calibrated mercury-type orifice meters which are presently being used at the Hinton station to record gas flow to the North Western Pulp & Power pulp mill. The results of the computer checked within 0.05 per cent of the average computed flow of the two flow meters for the 30-day period on a total flow of over 280 MMcf.

The measurement system is now being tested at the Bureau of Standards Testing Laboratories in Ottawa. Upon receipt of this approval, the orifice-type meters will be removed from Hinton and the computer will be installed to measure all further gas deliveries to the pulp mill.

The instrument uses the gas meter run and orifice plate as the basic measuring system with data from the meter run being fed into a special analog computer. Transducers connected to the meter run measure static, differential pressure and temperature of the flowing gas through the orifice plate in the meter run and from which electrical signals are transmitted to the computer.

From the signals supplied by the transducers, the computer corrects the flow of gas to base contract conditions instantaneously, eliminating any further correction factors. Computed flow rate is supplied to a magnetic integrator which gives an electrical pulse for a pre-selected increment of volume in standard cubic feet. This pulse is then used to operate a mechanical counter which gives a visual indication of accumulated corrected volume on an indicator. Also this volume is recorded on a strip chart recorder which registers instantaneous flow vs. time. A universal adaptor supplied with the unit makes it adaptable for measurement problems requiring the use of different size plates in various size meter runs.

Huber-Colorado Interstate gas sale turned down

J. M. Huber Corp.'s plan to sell gas to Colorado Interstate Gas Co. has been turned down by an FPC presiding examiner (Docket G-13800).

Presiding Examiner Edward B. Marsh held that CIG had not established the need for additional supplies of gas. And, therefore, had not shown that the proposed service, sale, operation, and construction is or will be required by the present or future public convenience and necessity.

Colorado Interstate contended, the examiner said, that the proposed sale was to replace, to the extent of 20 MMcf daily, gas it now receives from Phillips Petroleum Co. under a contract which ends Dec. 31 of this year. However, the examiner declared, the Phillips service can't be terminated without FPC approval. "To conclude now that the commission will permit the abandonment . . . would be premature and unrealistic," he said.

Producers filed 1939 rate increases in '58

Independent gas producers filed 1939 rate increases totaling about $44.8 million per year with the FPC in 1958, the commission reports.

During the year, FPC suspended, pending hearing and decision, 1064 increases totaling $37.6 million annually.

The 1958 figures compared with 2330 filings totaling $38.6 million annually in 1957. In that year there were 717 suspensions totaling $28 million.

PG&E asks state okay on line for Canadian gas

Pacific Gas & Electric Co., San Francisco, has asked California's PUC to okay construction of the California section of the proposed Canada - to - California pipeline. PG&E would spend $63.9 million on its 296-mile section of the 1300-mile line.

Already on file with the FPC (see February GAS, Pipeline News) is the application of Pacific Gas Transmission Co., a subsidiary, to build a line through Idaho, Washington and Oregon. Other applicatons by Canadian affiliates are on file with regulating agencies of the Province of Alberta and the Canadian government.

PG&E presently is bringing about 1 billion cu ft of gas into its territory daily from Texas and New Mexico fields, constituting two-thirds of its customers' requirements. "It is now in the public interest," the application said, "that PG&E obtain its out-of-state supplies of natural gas from more that one such source . . ."

Initial deliveries from Canada, to be made at the California-Oregon border near Klamath Falls, Ore., would average 415 MMcf daily.

Northern joins in helium operation

Northern Natural Gas Co. has joined with Air Products Inc., Allentown, Pa., to form a company to extract helium from natural gas (see GAS Highlights, February).

The new company—which marks the entry of private industry into the field—is known as Helex Co.

Northern's president J. F. Merriam, also president of the new company, said Helex plans to begin construction "as quickly as possible" on a $13.5 million extraction and purification plant near Sunray, Texas. He said the plant will process 120 MMcf of gas per day, yielding in one year some 260 MMcf of helium as compared with the total 1957 U. S. output of 292 MMcf.

Northern Natural is listed as principal stockholder in the new company. Air Products Inc., which specializes in processing gaseous

Visit NACE—Booth 114
Hotel Sherman, Chicago,
March 17–19, 1959

NOW IS NOT THE TIME FOR PIPE DREAMING

You can't afford to speculate with corrosion control!

Today you are tightening up on business operations. Risks are out. For pipeline protection, you can't afford to get away from time-tested corrosion control methods. Protective Coating Materials by Plastics and Coal Chemicals Division give you constant protection—superlative continuity, impermeability, bond, body strength, stability and chemical inertness. Made from highest quality coal-tar pitch—the shield that has proved best!

Proved and improved for three generations, these Pipeline Primers, Enamels and Auxiliary Protective Pipeline Felts form a lasting barrier against corrosive elements.

A staff of Field Service Experts are at your call to offer you technical assistance that can save you maintenance time and costs.

Always ask your applicator to use Protective Coating Materials produced by Plastics and Coal Chemicals Division. Write for full information.

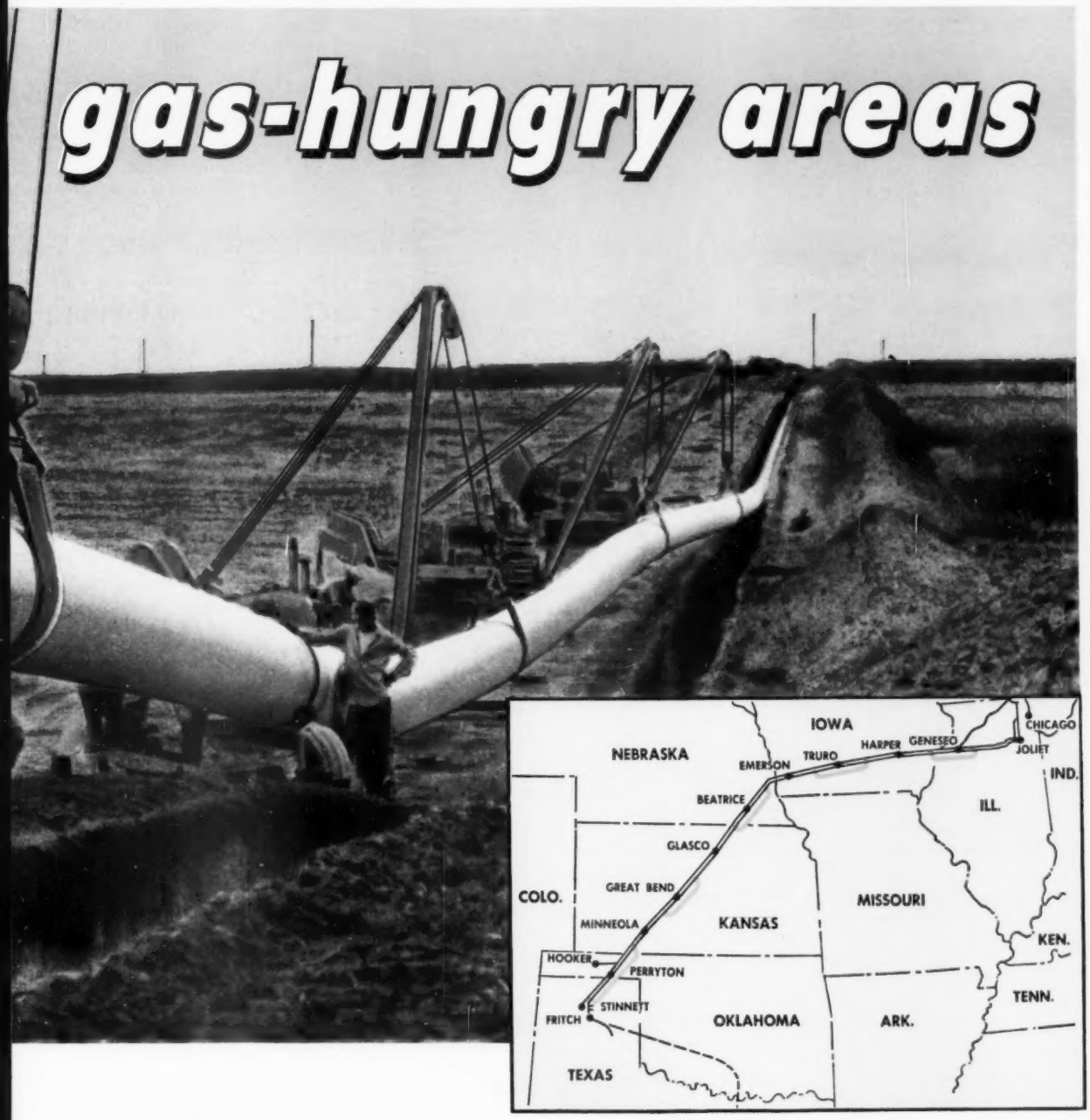
PLASTICS AND COAL CHEMICALS DIVISION
Formerly part of the Barrett Division
40 Rector Street, New York 6, N. Y.
In Canada: Allied Chemical Canada Ltd., 1450 City Councillors St., Montreal

Allied Chemical

Natural Gas Pipe Line Company of America completes 513 miles of looping line in record time

Additional supplies of natural gas from the Panhandle and north-central areas of Texas will soon flow through new lines, and initial deliveries to the Iowa, Illinois, Wisconsin and Indiana markets will be increased by 100 million cubic feet per day. Nearly five hundred miles of 36″ pipe and twenty miles of 26″ pipe have been laid . . . will bring new gas supplies to the midwestern markets. In furnishing a little more than half this pipe, A. O. Smith Corporation is proud to have helped serve Natural Gas Pipe Line Company of America and its tremendous markets.

gas-hungry areas



For 30 years . . .

A. O. Smith line pipe has always been manufactured to a high standard of quality . . . precisely controlled at every step of production. That's why A. O. Smith pipe made and installed in 1928 is still in operation. That's why so much A. O. Smith pipe has been used on so many important pipeline projects.

Through research A.O. Smith *. . . a better way*

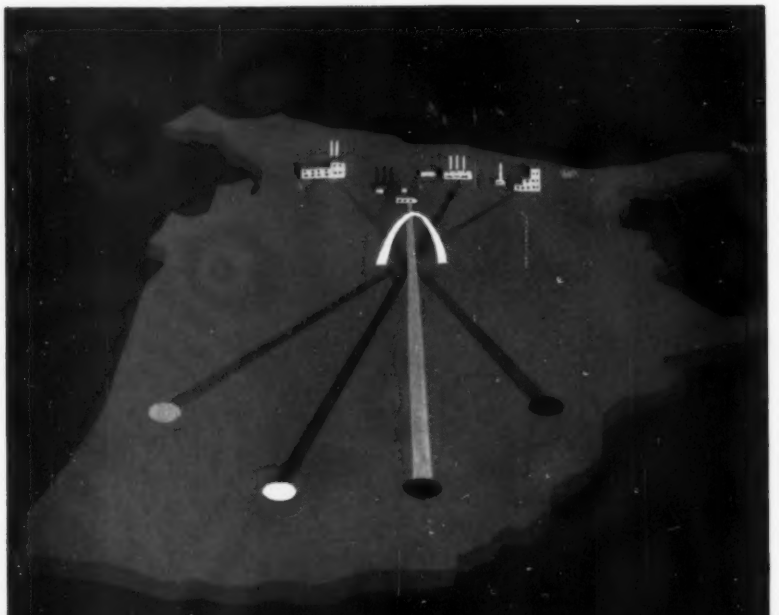
A.O.Smith

CORPORATION

TUBULAR PRODUCTS DIVISION

Milwaukee 1, Wisconsin

Chicago 3 • Dallas 35 • Houston 2 • Los Angeles 17 • Midland 5, Texas • New Orleans 12 • New York 17 • Tulsa 3 • A. O. Smith INTERNATIONAL S. A., Milwaukee 1, Wisconsin, U. S .A.



THE SMARTEST DISTANCE BETWEEN TWO POINTS!

. . . is through the St. Louis Gateway at SPI.

Existing railroad tariffs permit shipment of your pipe from the mills to your destination in most states west of the Mississippi River and some states east of the Mississippi River on "Through Rates" with stopover at our plant in St. Louis for coating and wrapping.

Here is the **one** plant designed and built to execute Standard Procedures that assure you the finest quality coating and wrapping. Here is the **one** plant with machines, methods and management always present to see that Standard Procedures are constantly followed.

Regardless of your pipe's destination in our territory, the smartest route is through the St. Louis Gateway at SPI.

Write for our new catalog.

Contact Our Nearest Representatives
C. J. ARNBRECHT, Jr., 5315 Sandra Way, Arvada, Colo.
R. W. KINKER, 712 Main St., Grinnell, Ia.
A. P. BAKER, Jr., Box 2429, Midland, Tex.
ROGER HORNBOSTEL, 759 Houston St., Memphis Tenn.
BASIL SHARP, 5763 E. 26th Place, Tulsa, Okla.

standard pipeprotection inc.

3000 SOUTH BRENTWOOD BLVD. • ST. LOUIS 17, MO.

and liquid components at extreme low temperatures, will construct the plant.

Natural gas for the extraction process will come from the Texas Hugoton and Panhandle fields. An area within a 250-mile radius of Amarillo constitutes the only known source of helium in the free world.

SNG • Pipeline Notes

Southern Counties Gas Co., Los Angeles, is working on a 13.5-mile, 30-in. line to supply gas to the Southern California Edison Co. steam electric generating plant at Huntington Beach. Pacific Pipeline Co. is building the line, which will cost $1.5 million and ultimately deliver up to 8.3 MMcf per hour.

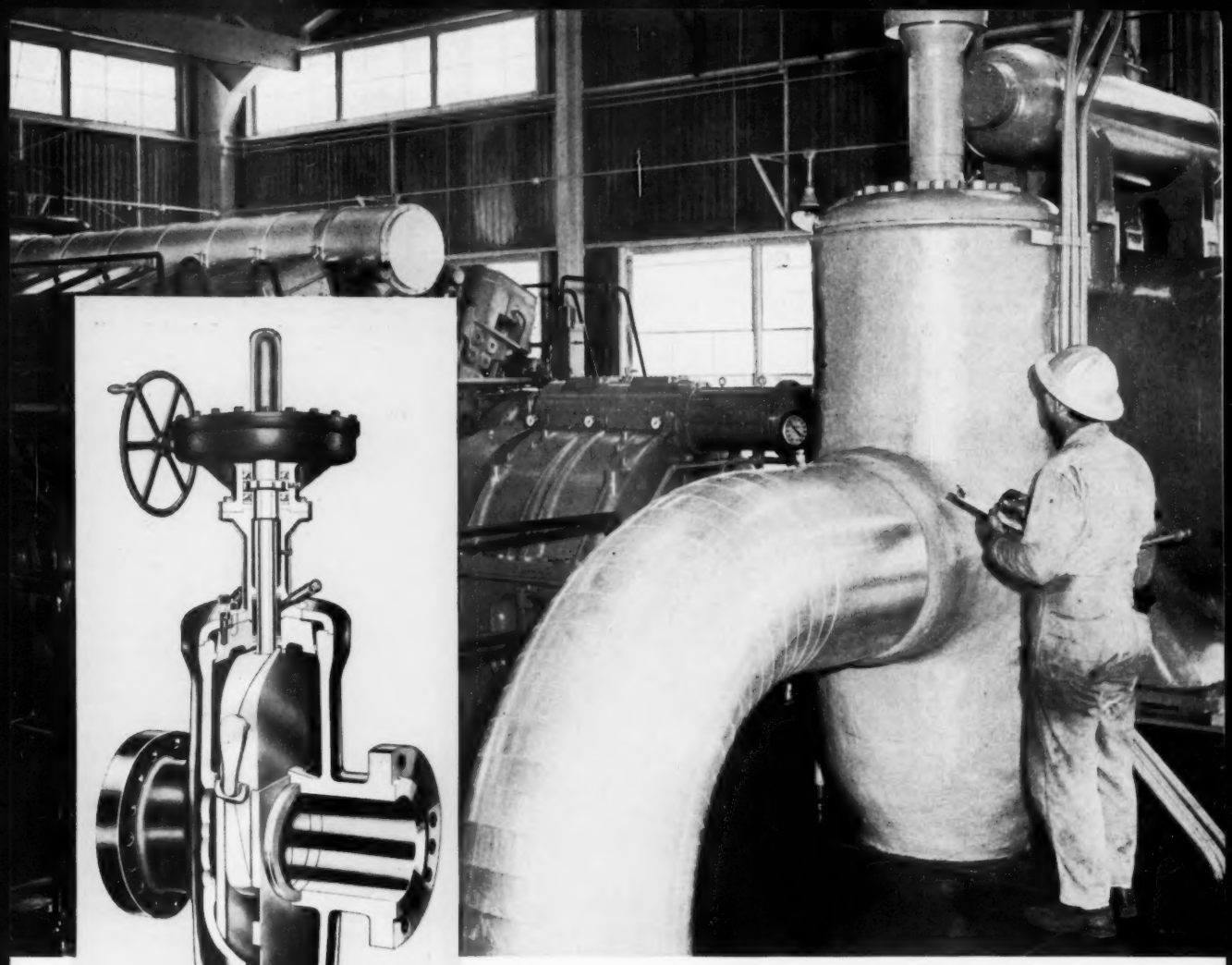
El Paso (Texas) Natural Gas Co. has a temporary okay from FPC to build new facilities to pick up additional supplies of gas in Lea county, N. M. (Docket G-15482). El Paso will spend $867,000 to add 2200 hp to its Eunice field compressor station.

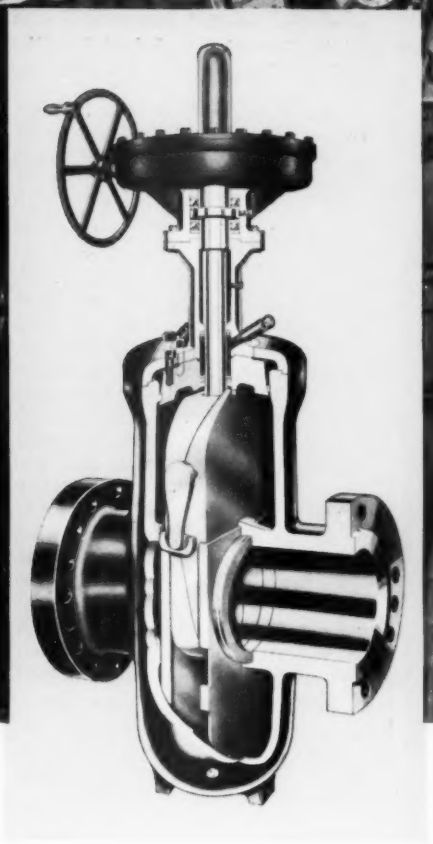
New York State Natural Gas Corp. has FPC authorization to build about 27 miles of 20-in. line from Elk county to Clearfield county, Pa. The $1.5 million facilities (Docket G-9860) will be used to take gas produced in the Luthersburg field, Clearfield county.

Columbia Gulf Transmission Co., New York, got an okay on new Louisiana construction covered in Docket G-15229. Covered in the $820,000 undertaking is construction of 11 miles of 12-in. lateral supply line in Cameron parish, La.

Koppers Co., Inc. will build a new research center at Monroeville, Pa. this year. Site development and initial construction of an administration building, three chemical labs, a power plant and supporting facilities are programmed to begin in 1959.

The Industrial Silencer Division of Burgess-Manning Co. has named Lynn McGuffy Co. Inc., as sales representatives. The McGuffy organization, headquartered in Shreveport, will cover southern Arkansas, northern Louisiana, and northern Mississippi.





W-K-M's *Creative Engineering* sets the standards for pipeline valves around the world

From 2-inch to 34-inch, W-K-M's ASA gate valves have earned the commendation of pipeliners from California to Iran, from Peru to Canada.

And why not?

No other pipeline valves are so carefully engineered to meet the practical requirements of pipeline service. No other valves will give you the same performance, the same long life, the same long-range economy. No other valves can be so easily or quickly overhauled "on-the-line."

For complete dependability, specify W-K-M when you requisition valves.

The W-K-M® ASA Gate Valve can be overhauled "on-the-line"

W-K-M designed this valve to save you time and money. W-K-M valves give you longer service between overhauls, and when overhaul is necessary, you can do the job while the valve is *on-the-line*. This one feature saves users of W-K-M valves thousands of dollars each year.

Other features include: Full bore through-conduit; exclusive gate centralizing mechanism; freedom from destructive turbulence; no-surge operation; free passage for pigs or scrapers.

WRITE FOR CATALOG 300

W-K-M

DIVISION OF ACF INDUSTRIES
INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

5813

GAS Pipeline People

John Kelley
Columbia Gulf

V. W. Meythaler
Texas Gas

J. W. Carneal
Texas Gas

Robert Garrett
Texas Gas

Officers of the newly acquired Columbia Gulf Transmission Co. have been named by Columbia Gas System Inc. They are: JOHN W. KELLEY, president; SEYMOUR N. ORLOFSKY, vice president; JOSEPH A. STAPLES, treasurer; E. O. BOTTLER, attorney and secretary; and W. A. KOROS, assistant treasurer. Kelley formerly was vice president of Atlantic Seaboard Corp., another Columbia Gas subsidiary. Of the officers of Gulf Transmission, three were formerly officers of Gulf Interstate, and a fourth, Bottler, was attorney for that company. Orlofsky was vice president, Staples was secretary and treasurer, and Koros was assistant treasurer.

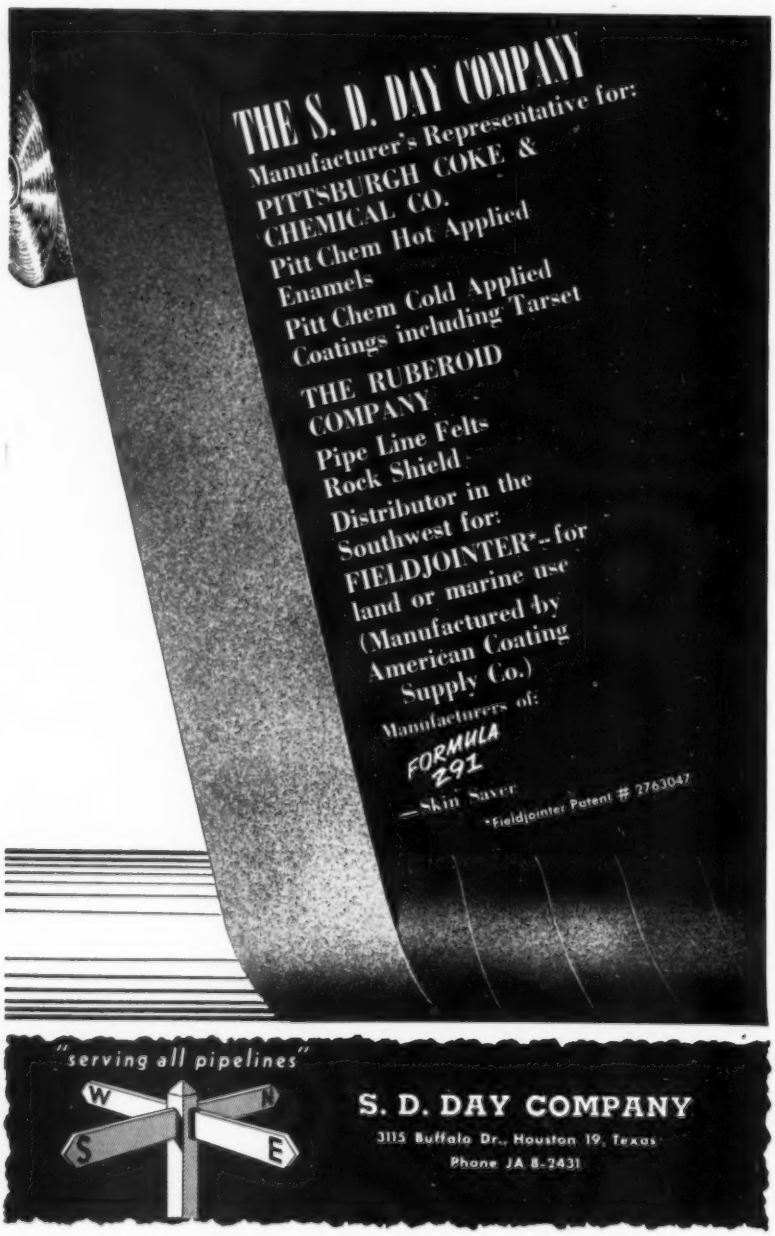
Several appointments were announced by Texas Gas Transmission Corp., Owensboro, Ky. V. W. MEYTHALER is now vice president and treasurer. He was formerly treasurer of the company and will retain responsibility for that function. J. W. CARNEAL has been promoted to director of sales and industrial development. He has been assistant director of sales and customer relations since 1956. ROBERT O. GARRETT is the newly elected president of Texas Gas Exploration Corp., Houston. Garrett formerly was vice president and general manager of the Texas Gas Transmission subsidiary. As president, he will continue as general manager and a member of the board of directors.

FRED W. BAILEY has joined J. B. Beaird Co., Shreveport, as general products sales representative.

DON C. LIVINGSTON has been named manager, two-way radio sales of a 10-state southern area by Motorola Communications & Electronics Inc., Chicago. He is succeeded as regional manager in Kansas-Missouri and southern Illinois by WILLIAM H. HAWKS, formerly a zone manager in Kansas City, Mo.

SAMUEL D. GREINER has been promoted to assistant products manager, motor-driven compressor sales, Cooper-Bessemer Corp., Mt. Vernon, Ohio. His work will be devoted principally to the application of motor-driven compressors for use on pipelines, industrial air, chemical, and petrochemical processing.

JOHN F. PETERSON has been named branch manager of Bristol Co.'s Newark, N. J., branch. Peter-



You're Money Ahead to
MEASURE PIPE PROTECTION WITH A CALENDAR

How should pipe protection be measured? By first cost? By ease of application? By appearance?

With all the claims made for protective tapes, too often the most important consideration is overlooked—the simple point of how long and how well it will protect the pipe.

Since 1941, when TAPECOAT originated coal tar coating in tape form, this protection has proved to be the best that money can buy for combatting corrosion underground or under water. Lines in service, TAPECOATED as far back as 17 years ago, show no signs of deterioration —a record of uninterrupted performance *no other type of tape can match*. Think what this means in terms of preventive maintenance and elimination of replacement costs!

After all, hot-applied coal tar has proven over the years to be the most dependable and enduring protection. And because TAPECOAT is a hot-applied coal tar coating in tape form, it offers the same lasting protection.

A TAPECOAT sales and service engineer is available at all times to assist you on any corrosion problem and on the various applications of TAPECOAT.

Write for complete details today.

PROVED IN SERVICE

...Underground or Under Water on

Pipe	**Tanks**
Pipe Joints	**Tie Rods**
Service Connections	**Conduit**
Mechanical Couplings	**Cables**
Fittings	**Splices**
Insulated Lines	**Bridge Crossings**

TAPECOAT comes in rolls of 2", 3", 4", 6", 18" and 24" widths—sized to the job. Available also in asphalt. Where primer is desired, specify TC Primecoat, the compatible coal tar primer.

TAPECOAT®
A PROTECTIVE COATING

VISIT US IN BOOTH 138 AT THE N.A.C.E. SHOW

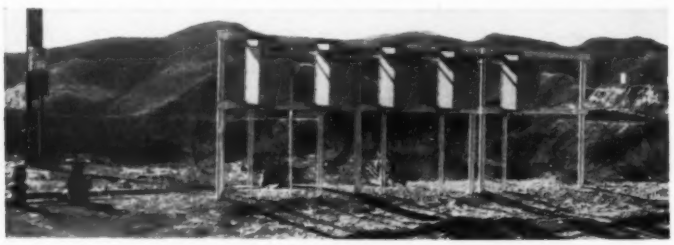
The **TAPECOAT** *Company*

1535 Lyons Street, Evanston, Illinois

Representatives in Principal Cities

Manufactured and Distributed in Canada by The Tapecoat Company of Canada, Ltd., 25 Haas Road, Rexdale, Ontario.

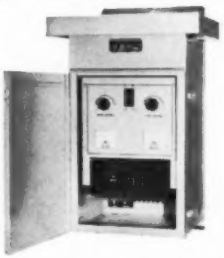
CATHODIC PROTECTION RECTIFIERS



Some of the 457 Lester Units Serving SHELL at Ventura, Calif.

Advantages:

- High Conversion Efficiency for Low Operating Cost
- Competitive First Cost
- Long Useful Life
- Easy Accessibility



LESTER EQUIPMENT MFG. CO., INC.

151 W. 17th St., Los Angeles 15, Calif.

Manufacturers of AC to DC Equipment Since 1932

John Peterson
Bristol

Julian Foster
Lone Star

son, who joined the company in 1948, most recently has been sectional sales engineer at Syracuse, N. Y. Bristol also has named HARRY E. BEANE JR. as sales engineer to serve the Albany-Syracuse area.

THOMAS A. HERON JR. has been named assistant division manager of Texas Eastern Transmission Corp.'s Division VI at Cuero, Texas. Before his promotion, Heron was division engineer at Division IV in Baytown, Texas.

WALTER L. DAVIDSON has been appointed sales manager of the engineering works division of Dravo Corp., Pittsburgh. With Dravo since 1942, Davidson most recently served as manager of the general sales department. The company also announced the appointment of ROBERT W. HILLER as assistant to the general manager of the engineering works division. He has been plant manager for the division since 1946.

C. A. WEAVER has been named service manager, Tulsa field office, by the domestic division of Cooper-Bessemer Corp., Mt. Vernon, Ohio.

NICHOLAS KAY has been appointed vice president in Koppers Co.'s Metal Products Division. He also becomes general manager of the division, headquartered in Baltimore.

JOHN M. KINDLE, 33 years to the day after joining Lone Star Gas Co., Dallas, was named vice president in charge of transmission for Lone Star and vice president and director of Lone Star Producing Co. He succeeds JULIAN L. FOSTER, who is retiring. Kindle has served as superintendent of operations in the transmission division and gas supply division of both companies since 1954. Foster has 40 years of uninterrupted service with Lone Star, beginning his career in 1918 just nine years after Lone Star re-

ACROSS 20 MILES OF OPEN SEA

Motorola Microwave controls offshore oil production

Off the coast of Louisiana, a Motorola microwave installation will soon be installed for CATC. 120 of its 175 miles is over open water, connecting 9 of 11 stations in a unique "loop" that provides maximum communications reliability. Should a transmitter, receiver or complete RF rack fail, the signal path could automatically change in 2 seconds, continuing service until repairs are made and the "loop" restored.

Soon, "add-on" equipment will provide automatic control and telemetering, making it possible for many of the platforms to be entirely unmanned except for maintenance visits.

Today in hundreds of inland drilling, pipeline and refinery operations, dependable Motorola microwave is used to read gages . . . to open and close valves . . . to start and stop motors . . . in addition to carrying voice and printed messages to and from centralized control centers. All this at the lowest per mile operating and maintenance cost.

Send today for Motorola's simplified microwave story . . . it will help you determine which combination of microwave uses best fit your operations.

THE COMMUNICATIONS SPECIALISTS TO INDUSTRY AND GOVERNMENT

MOTOROLA MICROWAVE

Motorola Communications & Electronics, Inc., 4501 West Augusta Blvd., Chicago 51, Illinois • SPaulding 2-6500 • A Subsidiary of Motorola, Inc.

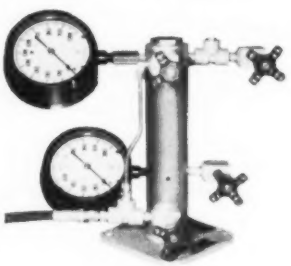
GARRETT
PRESSURE RELIEF
VALVES

REDUCE COSTLY
SHUT-DOWN TIME!

HERE'S HOW:

Without removing the valve body from the line, the set pressure and re-set pressure of a Garrett Relief Valve may be checked in a few minutes time. Using the small, light weight Garrett Test Fixture, pressure from bottled nitrogen or other source, and regular hand tools, pressures may be checked or changed by field personnel, without special training.

This is another feature of Garrett Relief Valves which adds to the safety and economy of your operations.



The Garrett Test Fixture is simple to use, light and easy to carry, and completely accurate in operation.

FOR COMPLETE INFORMATION, WRITE FOR CATALOG NO. RV-103-A

USI Garrett Oil Tools
Division U. S. Industries, Inc.
P. O. BOX 2427 • LONGVIEW, TEXAS

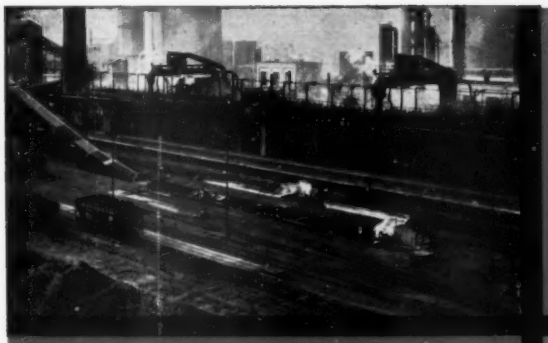
ceived its charter from the State of Texas. He holds the distinction of having participated in the planning or actual supervision of a great portion of Lone Star transmission and gathering pipelines. He has been vice president in charge of the transmission division since 1954.

JOHN F. MERRIAM, president of Northern Natural Gas Co., Omaha, was elected president of the newly formed Helex Co., which will extract helium from natural gas. Other officers are M. L. MEAD, senior vice president; F. C. NICHOLSON, vice president; W. H. THOMAS, vice president, sales; B. H. HARPER, secretary; and H. H. SIERT, treasurer.

Twelve new assignments, one resulting from the creation of a new department, have been announced by the sales department of Youngstown (Ohio) Sheet & Tube Co. RICHARD J. STAMBERGER, formerly district sales manager in New York, becomes manager of the new trade relations department. Other appointments: ROBERT W. WALLING from assistant manager to manager of high strength sales; ROY A. CURL from manager of sales promotion to manager of sales promotion and advertising; ROBERT B. DAVIDSON to assistant manager of Yoloy sales; DEAN N. FREDRICKSON to assistant manager of conduit sales; HERBERT L. FURSE to assistant manager of line pipe sales; OSCAR H. REUTER to assistant manager of standard pipe sales; ROBERT K. STEPHENS to assistant manager of carbon bar, rod and wire sales; WILLIAM H. STOKES to assistant manager of tin plate sales; FRANK A. ANDERSON to district sales manager at St. Louis; JOHN C. CLARK to assistant district sales manager in New York; and WILLIAM E. FENDER to assistant district sales manager in Indianapolis.

DONALD E. DIXON has rejoined Cooper-Bessemer Corp. He first joined Cooper-Bessemer in 1952, later becoming manager, compressor section sales. From that post he was appointed to the C-B Tulsa office.

Two officers of Ludlow Valve Manufacturing Co., Troy, N. Y., have been elected vice presidents. They are FORBES M. MESTON, vice president and treasurer, and FREDERICK W. WEMMERUS, vice president in charge of engineering.



From the day we produce them . . .

. . . till the day you apply them . . .

PITT CHEM Pipeline Enamels are Backed by a 4-Way Service Program

ON line after line, in all types of terrain and soil, tough, durable *Pitt Chem* Coal Tar Enamels have *proved* their superior ability to provide sure, economical pipeline protection—year after year. But there's *another* big reason why so many companies specify *Pitt Chem* Pipeline Enamels. And that's Pittsburgh's Four-Way service program:

1. Complete Quality Control As a basic producer, Pittsburgh maintains rigid quality control standards at every step of enamel production, from coal to finished coating.

2. Written Specifications Published to guarantee you consistently superior quality and performance from every drum of *Pitt Chem* Pipeline Enamels —in application and in service.

3. Experienced Sales Service *Pitt Chem* sales representatives are experienced coating men. They talk your language, will help you plan the many requirements of your coating job.

4. Technical Service Pittsburgh maintains a full time staff of field service men to work with your field men in the efficient, economical application of coattings. *Write us about your protection requirements!*

★ **PITT CHEM Pipeline Enamels**
★ **PITT CHEM Coal Tar Coatings**
★ **PITT CHEM Insul-Mastic Coatings**

WSW 6956

COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

— INDEX TO ADVERTISERS —

Adams Pipe Repair Products —
Aerotec Corp. —
Allied Chemicals, Plastics & Coal Chemicals Div. 147
American Cast Iron Pipe Co. 61
American Meter Co. 106
American Recording Chart Co. 94
American-Standard 107
Aqua Survey & Instrument Co. —
Arkla Air Conditioning Corp. 101

Barber-Greene Co. 58
Baso Inc. —
Beaird Co., Inc., J. B. —
Berry Hydraulics Div., Oliver-Tyrone Corp. —
Bethlehem Steel Co. 136, 137
Bilco Co. 91
Black, Sivalls & Bryson, Inc. Third Cover
Blaw-Knox Co. 135
Bonney Forge & Tool Works —
Bristol Co. 139
Browne Mfg. Co., Stewart R. 122
Bucyrus-Erie Co. 99
Burgess-Manning —
Burroughs Corp., ElectroData Div. 25
Busada Supply Co., Inc. 120
Byers Co., A. M. 118

Capitol Mfg. & Supply Co. 1
Cast Iron Pipe Research Assn. 52, 53
Cathodic Protection Service 98
Chaplin-Fulton Mfg. Co. 60
Charles Machine Works —
Chemtrol Corp. 118
Cleveland Trencher Co. 103
Connelly, Inc. —
Cooper-Bessemer Corp. —
Copon Associates —
Cosa Corp. —
Crose Mfg. Co., M. J. —
Cutler-Hammer Inc. 32, 33

Darling Valve & Manufacturing Co. —
Davey Compressor Co. —
Day Co., S. D. 152
Diebold Inc. —
Dollinger Corp. —
Dresser Industries, Inc. —
Clark Bros. Co. —
Dresser Manufacturing Div. 112, 113
Roots-Connersville Blower Div. 51
Southwestern Industrial Electronics Div. —

Eastman Chemical Products 35
Ebasco Services, Inc. —
Eclipse Fuel Engineering Co. —
Edwards Inc., Allan —
ElectroData Div., Burroughs Corp. 25
Electro Rust-Proofing Corp. 104
El Paso Natural Gas Co. —

Fisher Governor Co. 46, 47
Fisher Research Laboratory, Inc. 122
Flexonics Corp. —
Ford Motor Co., Tractor & Implement Div. 17-24
Foster Co., L. B. —
Foxboro Co. —

Gardiner Electronics Co. 122
Garrett Oil Tools, Inc. 156
General Controls —
Goodrich Chemical Co., B. F. 56
Grabler Manufacturing Co. 13
Grayson Controls Div., Robertshaw-Fulton Controls Co. 97
Greenlee Tool Co. —
Grove Valve & Regulator Co. 41

Hallen Construction Co., Inc. —
Hammarlund Mfg. Co., Inc. —
Hardwick Stove Co. —
Hays Manufacturing Co. 121
Heath Survey Consultants Inc. —
Hill, Hubbell Co. 45
Homestead Valve & Manufacturing Co. —
Houston Contracting Co. —

Industrial Polychemical Service 115
Ingersoll Rand Co. —
International Business Machines —
International Harvester Co. 5
International Petroleum Exposition 34

Jaeger Machine Co. —
Jones & Laughlin Steel Corp. —

Ka-Mo Tools Dept., Kwik-Mix Co. —
Kitson Valve Div., Welsbach Corp. —
Koenig Iron Works Inc. —
Kraloy Plastic Pipe Co., Inc. 110
Kwik-Mix Co., Ka-Mo Tools Dept. —

Laclede Steel Co. —
Ladish Co. 141
Lancaster Meter Parts Co. 116
Ledeen Manufacturing Co. 4
Lester Equipment Mfg. Co., Inc. 154
L.O.F. Glass Fibers Co. —
Lone Star Steel Co. 3
Ludlow Valve Mfg. Co., Inc. —

Maloney Co., F. H. —
Marbon Chemical Div., Borg-Warner Corp. 28
Mavor-Kelly Co. 154
Maxim Silencer Co. —
Maxitrol Co. 14, 15
May Products Inc. —
McCabe-Powers Body Co. —
Midwestern Pipe Line Products Co. —
Minneapolis-Honeywell Regulator Co. —
Motorola Communications & Electronics, Inc. 155
Mueller Co. 16, 57

National Tank Co. 124
National Tube Div., U. S. Steel Corp. —
Natural Gas Odorizing Inc. 10
Naugatuck Chemical Div., U. S. Rubber Co. —
Nordberg Manufacturing Co. —
Nordstrom Valve Div., Rockwell Manufacturing Co. 36, 37
Norton-McMurray Manufacturing Co. 119
Norwalk Valve Co. —

Oliver-Tyrone Corp., Berry Hydraulics Div. —
Onan & Sons, Inc., D. W. —
Oronite Chemical Co. 9
Ottawa Steel Div., Young Spring & Wire Corp. —

Parkhill Truck Co. —
Parsons Co. 109
Peerless Manufacturing Co. 108
Peerless Mfg. Div., Dover Corp. —
Perfex Plastics Inc. —
Perrault Equipment Co. —
Philadelphia Gear Corp. 50
Pipe Line Service Corp. 145
Pipe Protection Service Inc. —
Pittsburgh Coke & Chemical Co. 157
Polykon Products Div., Kendall Co. 30
Pritchard & Co., J. F. —

Radiator Specialty Co. 120
Reed Manufacturing Co. —
Regent-Jack Mfg. Co., Inc. 114
Reliance Regulator Div., American Meter Co. Second Cover
Republic Steel Corp. 38, 39
Reynolds Gas Regulator Co. 102
Ridge Tool Co. 96
Robertshaw-Fulton Controls Co., Grayson Controls Div. 97
Thermostat Div. 49
Rockwell Manufacturing Co.
Gas Products Div. Front Cover
Instrument Div. —
Nordstrom Valve Div 36, 37
Roots-Connersville Blower Div., Dresser Industries, Inc. 51
Royal McBee Corp. —
Royston Laboratories Inc. 133

Safety Gas Main Stopper Co. 119
Seamless Rubber Co. 54
Sheehan Pipeline Construction Co. —
Sheraton Corp. of America —
Siegler Heater Co. —
Skinner Co., M. B. 62
Sloane Manufacturing Co. 114
Smith Corp., A. O. 148, 149
Smith Manufacturing Co., A. P. 40
Somerville Construction Co. —
Sooner-Boomer Mfg. Div. 105
Southern Cross Foresters —
Southern Pipe Div., U. S. Industries 55
Sprague Meter Co. Fourth Cover
Stafford Co., R. W. 122
Standard Electric Time Co. 122
Standard Magnesium Corp. 115
Standard Pipeprotection, Inc. 150
Sun Shipbuilding & Dry Dock Co. —
Superior Meter Co. 26

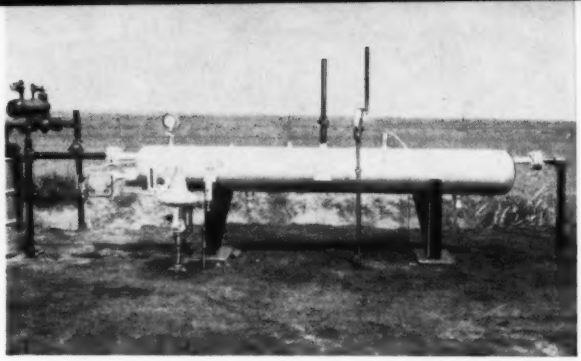
Tapecoat Co. 153
Taylor Forge & Pipe Works 42, 43
Tennessee Gas Transmission Co. —
Tex-Tube Inc. —
Thermac Co. 93
Tinker & Rasor —
Transcontinental Gas Pipe Line Corp. —
Tube Turns Inc. —

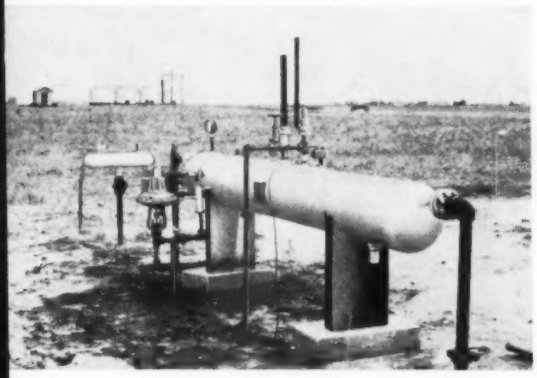
Union Carbide Corp., Union Carbide Chemicals Co. —
Union Malleable Mfg. Co. —
Union Switch & Signal Div. Westinghouse Air Brake Co. 143
United Engineers & Constructors —
U. S. Pipe & Foundry Co. 44
U. S. Rubber Co., Naugatuck Chemical Div. —
U. S. Steel Corp., National Tube Div. —
Universal Controls Corp. 120

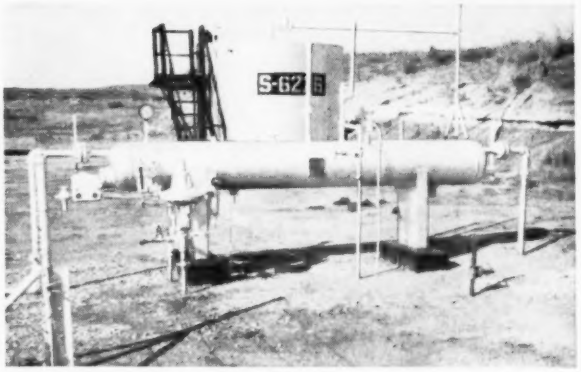
Vermeer Manufacturing Co. —
Vulcan Rubber Products, Inc. 7

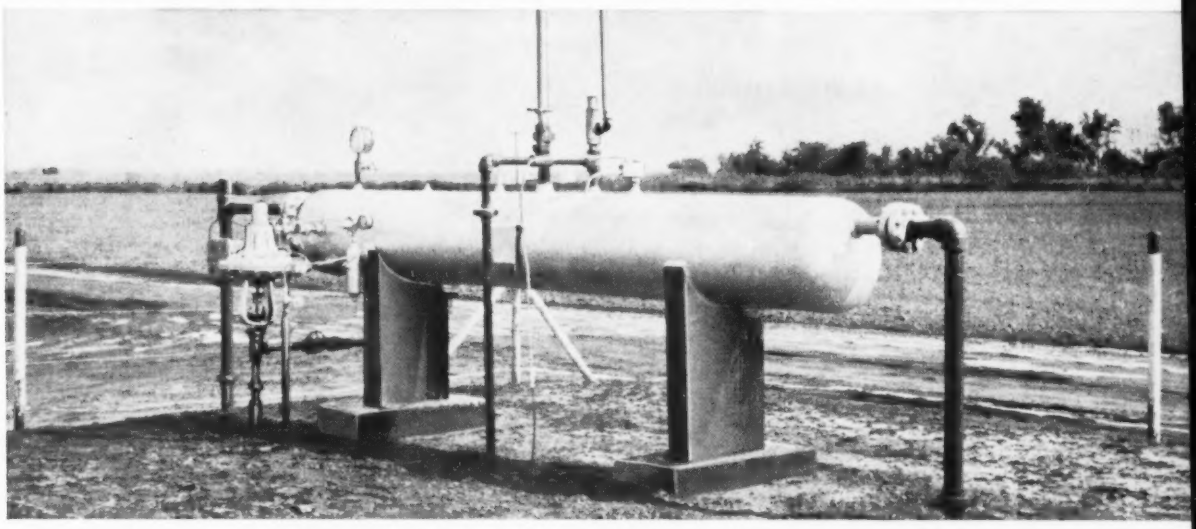
Walworth Co. 48
Warren Petroleum Corp. 122
Welsbach Corp., Kitson Valve Div. —
Western Plastics Corp. 100
Westinghouse Air Brake Co., Union Switch & Signal Div. 143
Wilcolator Co. 95
Williams Pressure Service Co. —
Williamson, Inc., T. D. —
W-K-M Div., ACF Industries 151
Wood Co., John 117

Yardley Plastics Co. 59
Youngstown Sheet & Tube Co. —









DC Separators Get The Job Done Right!

BS&B Model DC Separators, with exclusive internal design developed as the result of extensive laboratory and field tests, are daily proving themselves to be one of today's most highly efficient means of performing gas-liquid separation on high pressure wellstreams.

The five units pictured above are all on stream in Barber County, Kansas. Each of them has a shell diameter of 16″ and a working pressure of 1000 psi.

BS&B DC Separators are available in a complete range of sizes—diameters up to 84″—pressures up to 7500 psi.

Your BS&B Man will gladly provide detailed information.

EFFICIENCY OVER 60 YEARS RELIABILITY
BS&B
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON, INC., DEPT. I-BQ3, P. O. BOX 1714, OKLAHOMA CITY, OKLA.

BE SURE YOUR METERS ARE BEST IN

No. 240

BE SURE TO SPECIFY Sprague

Please your customers with a gas meter that measures up in *looks* as well as in performance. The well-proportioned case, clean-line design, and solid construction of all Sprague Meters looks good anywhere, inside the house or outside. And it's especially important now, with outdoor installations becoming more and more popular, that your meters compliment you and the houses they serve.

You can count on Sprague Meters to *stay* looking good for years, too! They're too tough to dent or corrode, and their practical, honest design has no fadish "gimmicks" that will quickly go out of style. For appearance sake, choose the hard-case meter that's easy on the eyes — choose Sprague.

The Sprague No. 240 Meter is designed for the increased loads in domestic heating and small industrial installations. It is adaptable to both low and intermediate pressure measurement and gives outstanding service under the most exacting conditions. Like all Sprague Meters, the 240 is good looking, rugged, and famous for sustained accuracy of measurement with low maintenance costs.
Other sizes from 175 to 1,000 cu. ft. Iron Case or Aluminum Case. (Synthetic or leather diaphragms in sizes 175 & 240.)

GEM Sponsor

Sponsor of "PLAYHOUSE 90" on CBS-TV

THE Sprague METER COMPANY • BRIDGEPORT 1, CONN.

WESTERN BRANCH — LOS ANGELES 23, CALIF. REGIONAL OFFICES — DAVENPORT, IOWA • HOUSTON 3, TEXAS • SAN FRANCISCO 11, CALIF.